This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

2 45 0422 0794

EX LIBRIS
DR. JAMES W. WARD

A TEXT-BOOK

OF

THE SCIENCE AND ART

OF

OBSTETRICS

BY

HENRY J. GARRIGUES, A.M., M.D.

CONSULTING OBSTETRIC SURGEON TO THE NEW YORK MATERNITY HOSPITAL; GYNÆCOLOGIST TO ST. MARK'S HOSPITAL; PROFESSOR OF OBSTETRICS IN THE POST-GRADUATE MEDICAL SCHOOL (RETIRED); PROFESSOR OF GYNÆCOLOGY AND OBSTETRICS IN THE SCHOOL FOR CLINICAL MEDICINE (RETIRED); HONORARY FELLOW OF THE AMERICAN GYNÆCOLOGICAL SOCIETY; HONORARY FELLOW OF THE OBSTETRICAL SOCIETY OF EDINBURGH; EX-PRESIDENT OF THE GERMAN MEDICAL SOCIETY, ETC.

WITH FIVE HUNDRED AND FOUR ILLUSTRATIONS

PHILADELPHIA AND LONDON
J. B. LIPPINCOTT COMPANY
1902

LANE LIBRARY

COPYRIGHT, 1902,
BY
J. B. LIPPINCOTT COMPANY.

ELECTROTYPED AND PRINTED BY J. B. LIPPINCOTT COMPANY, PHILADELPHIA, U. S. A.

124
24
1902

PREFACE

Unlike gynæcology, the science and art of obstetrics are hundreds and even thousands of years old, and most of its principles have long been firmly established. During the last twenty-five years only four really great improvements have been made,—antisepsis, with its offspring asepsis, the axis-traction forceps, the improved Cæsarean section, and the revival of symphyseotomy. This science can, therefore, be taught in a more didactic and less discursive way.

The aim of the author has been strictly to write a text-book, not a book of reference, as many books are that are called text-books, but abound in details, which only show the reading of their authors, and embarrass the student who wants to become acquainted with this branch of medicochirurgical science as well as the practitioner who seeks information about a case under his care. Few proper names have been introduced, and these mostly where it was necessary to designate certain instruments or methods of operating. The references made to the author's former writings should chiefly be looked upon as vouchers for his right to take the magisterial tone used in the text, as they show that the book largely is based on personal observation and research. Still, in treating of subjects about which he has written before, everything has been brought up to date.

Beginners ought to study obstetrics before gynæcology, since the former is the key to the latter. But, on the other hand, it would lead too far to describe in the text all that should be known by the student in order to understand obstetrics; and it would be too difficult for him to find what he needs in a text-book of gynæcology. The author, therefore, frequently refers to pages in his "Text-book of Diseases of Women," so as to enable the reader readily to look up those points which he needs for his obstetric studies.

In presenting the science and art of obstetrics the author has striven to lead the reader gradually from the simple to the compli-

59145

cated, from the easy to the difficult. All matters referring to the normal process of pregnancy, labor, and puerpery have, therefore, been placed before the description of abnormal conditions and their treatment.

Symphyseotomy being practically a new operation, and the Cæsarean section having undergone so great changes in recent times, the author has not thought it proper to treat of these operations in the same didactic tone in which the bulk of the book is written, but has entered into a discussion of different views and given references to many publications concerning them.

It is a peculiarity of obstetric art that the physician from the very moment he begins practising may encounter any kind of complications and difficulties, which have to be met at once. The author has, therefore, endeavored to be as brief, clear, and precise in expression as possible, although, on the other hand, he has tried to avoid unnecessary scientific dryness.

The work is so profusely illustrated that one who is somewhat familiar with this branch of science can refresh his memory by merely turning over its pages and looking at the pictures. Many of the illustrations are new and drawn directly from nature, in order to avoid the manifold inaccuracies found in current representations even of such solid objects as the bones of the pelvis.

As far as possible, objects are represented in their actual size, which is deemed much more instructive than to ask the reader to draw on his imagination in understanding mechanical problems and questions of development.

CONTENTS

NORMAL DIVISION

PART I.—FOUNDATION.

CHAPTER I.

PAGE
PUBERTY 1

CHAPTER II.

NUBILITY 2

CHAPTER III.

OVULATION AND THE OVUM 2

CHAPTER IV.

MENSTRUATION 13

CHAPTER V.

COPULATION 18

CHAPTER VI.

FECUNDATION 21

PART II.—NORMAL PREGNANCY.

CHAPTER I.

TRANSPORTATION AND EMBEDDING OF THE OVUM. DECIDUA 27

CHAPTER II.

CHORION 31

CHAPTER III.

PLACENTA 34

CHAPTER IV.

DEVELOPMENT OF THE OVUM AND THE EMBRYO 36

CHAPTER V.

AMNION 40

CHAPTER VI.

ALLANTOIS 40

CHAPTER VII.

PAGE

YOLK-SAC, OR UMBILICAL VESICLE 41

CHAPTER VIII.

FORMATION OF THE UMBILICAL CORD 42

CHAPTER IX.

NUTRITION 43

CHAPTER X.

SECRETION AND EXCRETION 45

CHAPTER XI.

RESPIRATION 46

CHAPTER XII.

CIRCULATION 46

CHAPTER XIII.

OTHER FUNCTIONS 51

CHAPTER XIV.

DURATION OF PREGNANCY 51

CHAPTER XV.

DEVELOPMENT OF THE FŒTUS IN EACH LUNAR MONTH 54

CHAPTER XVI.

VIABILITY 63

CHAPTER XVII.

MATURITY OF THE FŒTUS 64

CHAPTER XVIII.

OVUM AND PLACENTA AT TERM 66

CHAPTER XIX.

CAUSE OF THE SEX OF THE FŒTUS 73

CHAPTER XX.

ATTITUDE, PRESENTATION, AND POSITION OF THE FŒTUS 75

CHAPTER XXI.

CHANGES IN THE MOTHER DURING PREGNANCY 84

CHAPTER XXII.

THE UTERUS AT THE END OF PREGNANCY 98

CHAPTER XXIII.

SIGNS OF PREGNANCY 100

CHAPTER XXIV.

PAGE
DIFFERENTIAL DIAGNOSIS OF PREGNANCY 105

CHAPTER XXV.

PHYSICAL EXAMINATION 107

CHAPTER XXVI.

DIAGNOSIS BETWEEN THE FIRST AND LATER PREGNANCIES 121

CHAPTER XXVII.

BACTERIOLOGY OF THE VAGINA 125

CHAPTER XXVIII.

DRESS AND REGIMEN DURING PREGNANCY 126

PART III.—NORMAL LABOR.

CHAPTER I.

CAUSES OF LABOR 129

CHAPTER II.

THE ANATOMY OF THE PARTURIENT CANAL 130
A. The Pelvis 130
§ 1. The Bones of the Pelvis 130
§ 2. The Ligaments of the Pelvis 135
§ 3. The Pelvis as a Whole 137
§ 4. The Inclination and Axes of the Pelvis 141
§ 5. Differences between the Male and the Female Pelvis 144
§ 6. The Pelvis of the New-Born 144
§ 7. Differences of the Pelvis in Different Races 146
B. The Soft Parts of the Parturient Canal 147
§ 1. Muscles 147
§ 2. Fasciæ of the Perineum 151
§ 3. The Uterus. The Lower Uterine Segment 153
§ 4. The Cervix, the Vagina, and the Vulva 155

CHAPTER III.

THE FETAL HEAD 156

CHAPTER IV.

CHIEF FEATURES OF CHILDBIRTH 161

CHAPTER V.

THE EXPELLANT FORCES 163
§ 1. Innervation of the Uterus 163
§ 2. Labor-Pains 163
§ 3. Stages of Labor 167
§ 4. Influence of Labor on the Mother 177
§ 5. Influence of Labor on the Child 178
§ 6. Duration of Labor 179

CHAPTER VI.

PAGE
Cause of Respiration 179

CHAPTER VII.

Conduct of Normal Labor 180

CHAPTER VIII.

Care of the New-Born Child 208

CHAPTER IX.

Midwives 211

CHAPTER X.

Lying-in Institutions 216

PART IV.—NORMAL PUERPERY.

Definition 225

CHAPTER I.

The Condition of the Mother 226

CHAPTER II.

The Care of the Mother 233

CHAPTER III.

Signs of the Puerperal State 243

CHAPTER IV.

The Condition of the Child 244

CHAPTER V.

The Care of the Child 246

CHAPTER VI.

Congenital Weakness 253

ABNORMAL DIVISION

PART I.—ABNORMAL PREGNANCY.

CHAPTER I.

Multiple Fetation 257
§ 1. Superfecundation 257
§ 2. Superfetation 257
§ 3. Common Multiple Fetation 258

CHAPTER II.

PAGE
THE DEATH OF THE FŒTUS 261

CHAPTER III.

INTERRUPTION OF PREGNANCY 262
§ 1. Abortion 262
§ 2. Habitual Abortion 268
§ 3. Artificial Abortion 269
§ 4. Criminal Abortion 270
§ 5. Premature Labor 271
§ 6. Induction of Premature Labor 272
§ 7. Hunger Cure 274

CHAPTER IV.

MISSED LABOR 275

CHAPTER V.

MISSED ABORTION 276

CHAPTER VI.

DISEASES OF THE GENITAL ORGANS 276
§ 1. Malformations 276
Uterus Duplex Separatus, or Uterus Didelphys 278
Uterus Unicornis 279
Uterus Bicornis 281
Uterus Septus, or Uterus Bilocularis 282
§ 2. Inflammations 282
Decidual Endometritis 282
Metritis 284
Perimetritis 284
Colpitis, Vaginitis, or Elytritis 284
Ædœitis, or Vulvitis 287
§ 3. Pruritus Vulvæ 288
§ 4. Tumors 289
Vegetations, Venereal Warts, or Condylomata Acuminata .. 289
Varicose Veins 291
Hæmatoma, or Thrombus 292
Myoma of the Uterus 292
Sarcoma and Carcinoma of the Uterus 293
Ovarian Cyst 295
Operations during Pregnancy 296
§ 5. Displacements 297
Anteflexion of the Uterus 297
Anteversion of the Uterus 297
Retroflexion of the Uterus 297
Retroversion of the Uterus 300
Prolapse and Procidentia of the Uterus 300
Œdema of the Cervix 301
Hernia Uteri, or Hysterocele 301
Ectopic Gestation 302

CHAPTER VII.

PAGE
SYSTEMIC DISTURBANCES DUE TO PREGNANCY 318
§ 1. Hyperemesis, Severe or Uncontrollable Vomiting 318
§ 2. Ptyalism 321
§ 3. Constipation or Diarrhœa 321
§ 4. Toothache and Caries of the Teeth 321
§ 5. Cough 321
§ 6. Dyspnœa 321
§ 7. Palpitations 321
§ 8. Lypothymia 322
§ 9. Insomnia 322
§ 10. Headache 322
§ 11. Neuralgia 322
§ 12. Chorea 323
§ 13. Tetany 323
§ 14. Tetanus 324
§ 15. Paralysis 324
§ 16. Convulsions 325
§ 17. Insanity 333
§ 18. Irritability of the Bladder 334
§ 19. Enuresis 334
§ 20. Retention of Urine 334
§ 21. The Kidney of Pregnancy and Nephritis 334
§ 22. Fever of Pregnancy 335
§ 23. Icterus 335
§ 24. Progressive Pernicious Anæmia 336
§ 25. Leucocythæmia, or Leukæmia 336
§ 26. Pemphigus 337
§ 27. Impetigo Herpetiformis 337
§ 28. Mastitis 337
§ 29. Eczema of the Areola 337

CHAPTER VIII.

COMPLICATION WITH ACUTE INFECTIOUS DISEASES 338
§ 1. Gonorrhœa 338
§ 2. Other Acute Infectious Diseases: Scarlet Fever, Measles, Smallpox, Malaria, Influenza, Typhoid Fever, Cholera, Pneumonia, Pleurisy, Erysipelas, Hydrophobia, Septicæmia 338

CHAPTER IX.

COMPLICATION WITH CHRONIC DISEASES 340
§ 1. Syphilis 340
§ 2. Tuberculosis 342
§ 3. Heart Disease 343
§ 4. Hæmophilia 344
§ 5. Hernia 344

CHAPTER X.

DEATH OF THE MOTHER DURING PREGNANCY 345

CHAPTER XI.

PAGE
DISEASES OF THE OVUM 346
§ 1. Amniotic Bands 346
§ 2. Hydramnion, or Hydramnios 346
§ 3. Scanty Liquor Amnii 349
§ 4. Cystic Degeneration of the Villi of the Chorion; Vesicular Mole 349
§ 5. Cellular Hypertrophy and Hyperplasia of the Villi, or Myxoma Fibrosum Placentæ 352
§ 6. Diseases of the Decidua 352
Atrophy of Decidua 352
Hypertrophy of Decidua 352
Cystic Decidua 352
Hemorrhagic Endometritis; Fleshy Mole 352
Hydrorrhœa Gravidarum 352
§ 7. Anomalies of the Placenta 354
§ 8. Anomalies of the Umbilical Cord 355
§ 9. Changes in the Fœtus after its Death 355

PART II.—ABNORMAL LABOR (DYSTOCIA).

CHAPTER I.

FAULTY UTERINE CONTRACTIONS 357

CHAPTER II.

FAULTY ABDOMINAL PRESSURE 361

CHAPTER III.

UNFAVORABLE POSITION, PRESENTATION, OR ATTITUDE OF FŒTUS 362
§ 1. Occipitoposterior Positions 362
§ 2. Occipitolateral Position 365
§ 3. Lateral Obliquity of the Head 366
§ 4. Face Presentation 367
§ 5. Brow Presentation 374
§ 6. Pelvic Presentation 376
§ 7. Transverse Presentations 391
§ 8. Compound Presentation 395

CHAPTER IV.

EXCESSIVE SIZE OF FŒTUS 397
§ 1. Giant Children 397
§ 2. Hydrocephalus 399
§ 3. Other Cephalic Enlargements 401
§ 4. Abdominal Enlargement 401
§ 5. Other Swellings 402

CHAPTER V.

TWIN LABOR 403

CHAPTER VI.

PAGE
DOUBLE MONSTROSITIES 408

CHAPTER VII.

ABNORMALITIES OF THE OVUM 412
§ 1. Abnormal Membranes 412
§ 2. Abnormalities of the Umbilical Cord 413
§ 3. Retained and Adherent Placenta 417
§ 4. Placenta Prævia 419

CHAPTER VIII.

OBSTRUCTIONS IN THE PARTURIENT CANAL 420
§ 1. Displacements of the Uterus 420
§ 2. Abnormalities of the Cervix 423
§ 3. Obstruction in the Vagina 427
§ 4. Diseases of the Vulva 428
§ 5. Uterine Tumors 429
§ 6. Ovarian Tumors 432
§ 7. Other Abdominal Tumors 433
§ 8. Vaginal and Vulvar Tumors 433

CHAPTER IX.

DEFORMITIES OF THE PELVIS 436
A. Common Deformities 444
§ 1. Generally Equally Contracted Pelvis 444
§ 2. Flat Pelvis 448
§ 3. Generally Contracted Flat Pelvis 456
§ 4. Pelvis Flattened by Dislocation of both Femora 456
§ 5. Dangers for the Mother in Cases of Contracted Pelvis 458
§ 6. Dangers for the Fœtus in Contracted Pelvis 459
§ 7. Treatment of Labor in Flat or Generally Contracted Flat Pelvis 463
B. Rarer Deformities of the Pelvis 467
§ 1. Asymmetric Pelvis 467
1. Scoliotic and Scoliotic-Rhachitic Pelvis 467
2. Obliquely Contracted Pelvis, or Naegele Pelvis 468
3. Coxalgic Pelvis 471
§ 2. Transversely Contracted Pelvis 474
1. Ankylosed Transversely Contracted Pelvis 475
2. Kyphotic Pelvis 476
3. Funnel-Shaped Pelvis 481
§ 3. Incurved Pelvis 482
1. Osteomalacic Pelvis 483
2. Pseudo-Osteomalacic Rhachitic Pelvis 489
§ 4. Spondylolisthesis 490
§ 5. Pelvis Contracted by Tumors springing from the Pelvic Bones. 493
§ 6. Split Pelvis 494
1. Pelvis Split at Symphysis Pubis 494
2. Pelvis Split at Sacrum 496
§ 7. Too Wide Pelvis 496

CHAPTER X.

PAGE
HEMORRHAGE 496
§ 1. Placenta Prævia 496
§ 2. Premature Detachment of Normally inserted Placenta 505
§ 3. Rupture of the Circular Sinus of the Placenta 507
§ 4. Rupture of Umbilical Vessels in Velamentous Insertion of Cord 509
§ 5. Post-partum Hemorrhage 509
§ 6. Inversion of the Uterus 516
§ 7. Thrombus, or Hæmatoma, of the Vulva and Vagina 521
§ 8. Thrombus, or Hæmatoma, of the Cervix 523
§ 9. Childbirth without Loss of Blood 524

CHAPTER XI.

ECLAMPSIA 525

CHAPTER XII.

HEART DISEASE 525

CHAPTER XIII.

RUPTURE OF ORGANS 525
§ 1. Rupture of the Uterus 525
§ 2. Pressure Necrosis of the Uterus or Vagina 532
§ 3. Laceration of the Cervix Uteri 534
§ 4. Laceration of the Vagina 535
§ 5. Laceration of Vulva and Perineum 536
§ 6. Rupture of Spleen, Heart, Blood-vessels, or Psoas Muscle 546

CHAPTER XIV.

SEPARATION OF ARTICULATIONS 546

CHAPTER XV.

FRACTURES OF BONES 547

CHAPTER XVI.

SUDDEN DEATH OF THE MOTHER DURING LABOR 548

CHAPTER XVII.

CHILDBIRTH AFTER THE DEATH OF THE MOTHER 550

CHAPTER XVIII.

INJURY TO THE FŒTUS DURING LABOR 552
§ 1. Cephalæmatoma 553
§ 2. Asphyxia 555
§ 3. Avulsion of the Head 563

PART III.—OBSTETRIC OPERATIONS.

CHAPTER I.

PAGE
Tamponade 565

CHAPTER II.

Artificial Dilatation of the Cervix during Pregnancy 566

CHAPTER III.

Curettage 569

CHAPTER IV.

Induction of Premature Labor 572

CHAPTER V.

Vaginal and Intra-Uterine Injections 577

CHAPTER VI.

Intravenous and Subcutaneous Injections 581

CHAPTER VII.

Artificial Dilatation of the Cervix during Labor 583

CHAPTER VIII.

Expression of the Fœtus 589

CHAPTER IX.

Preparation for Operations 590

CHAPTER X.

Forceps Delivery 594

CHAPTER XI.

Version 618
- § 1. By the External Method 618
- § 2. By the Internal Digital Method 619
- § 3. By the Internal Manual Method 623
- § 4. Cephalic Version 624
- § 5. Pelvic Version 626
- § 6. Podalic Version 627

CHAPTER XII.

PHYSEOTOMY 637
- **Pubiotomy** 651
- **Ischiopubiotomy** 654
- **Bibliographic References** 656

CHAPTER XIII.

[illegible] 657

CHAPTER XIV.

PAGE
CÆSAREAN SECTION 658

CHAPTER XV.

UTERO-OVARIAN AMPUTATION 670

CHAPTER XVI.

PANHYSTERECTOMY 674
§ 1. Abdominal Hysterectomy 674
§ 2. Vaginal Hysterectomy 675

CHAPTER XVII.

EMBRYOTOMY 677
§ 1. Craniotomy 677
§ 2. Decapitation 685
§ 3. Evisceration 686
§ 4. Brachiotomy 687
§ 5. Cleidotomy 687

PART IV.—ABNORMAL PUERPERY.

CHAPTER I.

PUERPERAL INFECTION 688
§ 1. Nature of the Disease 688
§ 2. Etiology 695
§ 3. Pathology 702
§ 4. Symptoms, Diagnosis, and Prognosis 707
Ædœitis and Colpitis 707
Endometritis and Metritis 708
Salpingitis and Oöphoritis 709
Parametritis (Cellulitis of the Pelvis) 709
Lymphangeitis and Lymphothrombosis 710
Peritonitis 711
Pleurisy 713
Pneumonia 713
Pericarditis 713
Phlegmasia Alba Dolens 713
Phlebitis 714
Endocarditis 716
Disturbances in the Alimentary Canal 717
Nephritis 717
Disturbances in the Nervous System 717
Arthritis 718
Phlegmon (Cellulitis of the Limbs) 718
Skin Diseases 718
Acutest Septicæmia 718
Mortality 719
Gonorrhœic Infection 719
§ 5. Treatment 720
I. Prevention of Puerperal Infection in Hospitals 723
II. Prevention of Puerperal Infection in Private Practice. 726
III. Curative Treatment of Puerperal Infection 728
Bibliographic References 746

CHAPTER II.

PAGE
DISEASES OF THE UTERUS 747
§ 1. Subinvolution of the Uterus 747
§ 2. Superinvolution of the Uterus 750
§ 3. Retention of Parts of Placenta or Membranes 751
§ 4. Malignant Tumor of Pregnancy 752
§ 5. Secondary Post-partum Hemorrhage 755
§ 6. Displacements 755

CHAPTER III.

FIBROIDS OF THE ABDOMINAL WALL 758

CHAPTER IV.

DISEASES OF THE BREASTS 758
§ 1. Anomalous Milk Secretion 758
§ 2. Sore Nipples 761
§ 3. Deep Inflammation of the Nipples 764
§ 4. Eczema of the Areola 765
§ 5. Cellulitis and Adenitis of the Areola 765
§ 6. Erysipelas of the Breasts 765
§ 7. Lymphangeitis of the Breasts 766
§ 8. Mastitis 766
§ 9. Swelling and Milk Retention in the Axilla 773
§ 10. Fistulæ of the Breasts 774
§ 11. Galactocele 774
§ 12. Hypertrophy of the Breasts 775

CHAPTER V.

DISEASES OF THE UROPOIETIC ORGANS 776
§ 1. Retention of Urine 776
§ 2. Incontinence 777
§ 3. Cystitis 777
§ 4. Fistulæ 778

CHAPTER VI.

DISEASES OF THE CIRCULATORY ORGANS 781
§ 1. Embolism and Thrombosis of Arteries 781
§ 2. Thrombosis and Embolism of the Venous System ; Heart-Clot ... 782
§ 3. Entrance of Air into Uterine Veins 786
§ 4. Gangrene of the Legs 787
§ 5. Anæmia 788

CHAPTER VII.

DISEASES OF THE NERVOUS SYSTEM 789
§ 1. Neuralgia and Pressure Paralysis 789
§ 2. Neuritis and Polyneuritis 789
§ 3. Tetanus and Tetanoid Contractions 791
§ 4. Eclampsia 795
§ 5. Insanity 795

CHAPTER VIII.

PAGE
Eruptive Fevers 798

CHAPTER IX.

Other Fevers 800

PART V.—NOTES ON DISEASES OF NEW-BORN CHILDREN.

CHAPTER I.

Diseases of the Navel 801
§ 1. Umbilical Fungus 801
§ 2. Umbilical Hemorrhage 801
§ 3. Umbilical Arteritis 802
§ 4. Umbilical Phlebitis 802
§ 5. Gangrene 802

CHAPTER II.

Puerperal Infection 802

CHAPTER III.

Gonorrhœal Infection 803
§ 1. Ophthalmia Neonatorum 803
§ 2. Gonorrhœal Stomatitis 806
§ 3. Gonorrhœal Œdœocolpitis 806

CHAPTER IV.

Diseases of the Mouth 806
§ 1. Sprue 806
§ 2. Bednar's Aphthæ 807
§ 3. Injury to Epithelial Pearls 808

CHAPTER V.

Glandular Swellings 809
§ 1. Mastitis 809
§ 2. Hypertrophy of the Thymus Gland 810

CHAPTER VI.

Skin Diseases 810
§ 1. Erythema 810
§ 2. Eczema 811
§ 3. Miliaria; Pemphigus 811
§ 4. Erysipelas 812
§ 5. Ichthyosis 813
§ 6. Sclerema 813

CHAPTER VII.

Diseases of the Digestive Organs 814
§ 1. Colic 814
§ 2. Constipation 815
§ 3. Diarrhœa 815
§ 4. Icterus 817

CHAPTER VIII.

PAGE
TETANUS 817

CHAPTER IX.

DISEASES OF THE AIR-PASSAGES 818
§ 1. Nasal Catarrh 818
§ 2. Catarrhal Laryngitis 819
§ 3. Atelectasis 819

CHAPTER X.

CONGENITAL DISEASES OF THE HEART AND LARGE BLOOD-VESSELS 820

CHAPTER XI.

CYANOSIS 820

CHAPTER XII.

HEREDITARY SYPHILIS 821

CHAPTER XIII.

HEMORRHAGE 824
§ 1. Hemorrhage from the Vagina 824
§ 2. Hemorrhage from the Intestinal Tract; Melæna 824
§ 3. Hemorrhage from the Kidneys; Acute Hæmoglobinuria; Winckel's Disease 825
§ 4. Acute Fatty Degeneration; Buhl's Disease 825
§ 5. Pulmonary Apoplexy 826

CHAPTER XIV.

DEFORMITIES 826
§ 1. Harelip 826
§ 2. Cleft Palate 826
§ 3. Tongue-Tie, or Ankyloglossum 826
§ 4. Encephalocele, or Hernia Cerebri; Meningocele 826
§ 5. Spina Bifida, or Hydrorrhachis 827
§ 6. Umbilical Hernia 828
§ 7. Atresia Ani 829

CHAPTER XV.

SUDDEN DEATH OF THE NEW-BORN CHILD 830

LIST OF ILLUSTRATIONS

FOUNDATION.

FIGURE PAGE
1. Ovary of human fœtus of ten or eleven weeks 3
2. Part of ovary near surface, from human fœtus of sixteen weeks 3
3. Part of ovary near surface, from human fœtus of twenty-eight weeks 3
4. Part of ovary near surface, from human fœtus of thirty-six weeks 4
5. Part of section from surface to hilum of ovary of girl three days old 4
6. Section of ovary of bitch six months old 4
7. Graafian follicles from new-born child 5
8. Graafian follicle from girl seven months old 5
9. Primordial ova undergoing division 6
10. Ovary and tube, nineteen-year-old girl 6
11. Ovary and tube, girl twenty-four years old 7
12. Section of ovary of cat, enlarged six times 8
13. Part of same, enlarged twenty-four times 8
14. Section of ovary of woman twenty-two days after menstruation 9
15. Section of ovary of a woman on the first day of menstruation 9
16. Perpendicular section of the cortical substance of the ovary: *A*, new-born; *B*, four years old; *C*, twenty years old 10
17. Young Graafian follicle, pig 10
18. Follicle in middle stage, pig 11
19. Ovary, woman, fresh corpus luteum 11
20. Human ovum 12
21. Uterus during menstruation 14
22. Section of endometrium, menstruating woman 15
23. Fibre of endometrium 16
24. Vessels of the vagina and internal genitals in their relation to the superficial muscular structures 18
25. Hymen with linear opening 19
26. Annular hymen 19
27. Crescent-shaped hymen 20
28. Indented hymen 20
29. Ruptured hymen 21
30. Human spermatozoids 22
31. Fecundation of ovum of mouse 23
32. Fecundation of ovum of mouse 23
33. Fecundation of ovum of mouse 23
34. Fecundation of ovum of mouse 23
35. Fecundation of ovum of mouse 23
36. Fecundation of ovum of mouse 23
37. Fecundation of ovum of mouse 24
38. Fecundation of ovum of mouse 24
39. First stages of segmentation in rabbit 25
40. Later stages of segmentation in rabbit 25

NORMAL PREGNANCY.

FIGURE PAGE
41. Section of decidua of pregnancy 28
42. Uterus of woman, decidua in beginning pregnancy 28
43. Embedding of human ovum 29
44. Pregnant uterus, twenty-fifth day; decidua vera and reflexa 30
45. Human ovum, two weeks old, villi and embryo 31
46. Blood-vessels of villus 32
47. First connection between ovum and uterine epithelium, monkey 33
48. First insertion of villi in decidua 33
49. Structure of human placenta 34
50. Villi bathed in maternal blood 35
51. Transverse section of villus at term 35
52. Transverse section through front end of primitive streak and blastoderm of chick 36
53. Transparent area of blastoderm of chick, very early, commencement of primitive streak 37
54. Pyriform transparent area of chick's blastoderm with primitive groove 37
55. Blastoderm of chick, eighteen hours 38
56. Transverse section through chick before and after closure of medullary canal 38
57. Five figures showing development of membranes 39
58. Longitudinal vertical section of chick and neighboring parts of blastoderm, fourth day 40
59. Longitudinal section through posterior part of chick, third day; beginning allantois 41
60. Formation of umbilical cord and its central insertion 42
61. First circulation in vascular area of yolk-sac 47
62. Same, a little later 48
63. Second, or placental, circulation 48
64. Fetal heart and chief blood-vessels 48
65. Spee's ovum, second week, embryo in side view 55
66. Same embryo from above 55
67. Same ovum showing relations to chorion 55
68. Same ovum, embryo in longitudinal section 55
69. Older human ovum of Spee 55
70. Same in longitudinal section 55
71. Human ovum and embryo, from twelve to thirteen days, Allen Thomson 56
72. Human ovum and embryo, fourteen days, Allen Thomson 56
73. Human embryo, less than fourteen days, His 56
74. Human embryo, between sixteen and eighteen days, His 56
75. Human embryo, three weeks, Allen Thomson 57
76. Human embryo, four weeks, Allen Thomson 57
77. Human ovum with embryo, four weeks, Waldeyer 57
78. Human ovum, end of first month 57
79. Gravid uterus, woman, ovum and embryo, five weeks 58
80. Human embryo, beginning of second month, from eight to ten millimetres long 59
81. Human embryo, nearly five weeks 59
82. Human embryo, six weeks 59
83. Human embryo, about seven weeks 59
84. Human embryo, about eight weeks 60
85. Human ovum and fœtus, end of the second month 60

FIGURE PAGE
86. Human fœtus, fourth month ... 61
87. Human fœtus, end of fourth month ... 62
88. Human fœtus, fifth month ... 62
89. Horizontal circumference of head ... 65
90. Microscopical elements in liquor amnii ... 67
91. Liquor amnii cells treated with ether ... 67
92. Placenta, fetal surface ... 68
93. Placenta, maternal surface ... 69
94. Insertion of placenta ... 69
95. Double placenta ... 69
96. Battledoor placenta ... 70
97. Velamentous insertion of cord ... 70
98. Origin of velamentous insertion ... 70
99. Origin of velamentous insertion ... 70
100. Transverse section of umbilical cone ... 71
101. Transverse section of umbilical cord ... 71
102. Capillaries at boundary-line between abdominal umbilicus and cord ... 71
103. Fold of Schultze ... 72
104. Vessels of umbilical cord ... 72
105. Umbilical vesicle and omphalomesenteric vessels ... 73
106. Attitude of fœtus at term, vertex presentation, left occipito-anterior position ... 76
107. Face presentation, left mento-anterior position ... 77
108. Breech presentation ... 78
109. Knee presentation ... 79
110. Foot presentation ... 80
111. Shoulder presentation, dorsoposterior position ... 81
112. Shoulder presentation, dorso-anterior position ... 82
113. Effect of gravity on fœtus in globular uterus during early pregnancy ... 83
114. Effect of gravity on fœtus at end of pregnancy ... 83
115. Virgin uterus, natural size ... 84
116. Size of uterus at the end of each calendar month of pregnancy ... 85
117. Uterine muscle-cells ... 85
118. Uterus at term, *in situ* ... 86
119. Musculature of pregnant uterus, side view ... 87
120. Musculature of pregnant uterus, front view ... 88
121. Inner muscular layer of pregnant uterus ... 89
122. Longitudinal section through lower uterine segment of a pregnant uterus ... 90
123. Same with muscular lamellæ pulled apart ... 90
124. Similar section showing shortening of musculature after birth ... 90
125. Uterus and fœtus at the end of pregnancy ... 91
126. Blood-vessels of pregnant uterus ... 92
127. Nerves of pregnant uterus ... 93
128. Course of ureter, end of pregnancy ... 94
129. Vulva, anterior wall of vagina bulging out ... 92
130. Breast of blonde outside of pregnancy ... 93
131. Breast of blonde during pregnancy ... 93
132. Breast of brunette outside of pregnancy ... 94
133. Breast of brunette during pregnancy ... 94
134. Acinus of mammary gland, girl sixteen years ... 95
135. Acini, girl eighteen years ... 95

FIGURE PAGE
136. Mammary gland during lactation 96
137. Abdominal striæ 96
138. Colostrum 96
139. Longitudinal section through body of woman at term 99
140. Hysterical tympanites 106
141. Same patient anæsthetized 106
142. Examination-table 108
143. Dorsal position 108
144. Palpating fundus uteri, seventh month 109
145. Palpating back of fœtus 110
146. Palpating head with both hands 111
147. Palpating head with one hand from above 112
148. Palpating head from below 113
149. Small fetal parts turned against anterior wall 114
150. Bimanual examination 115
151. Internal pelvimetry 116
152. Harris's pelvimeter 116
153. Rhomb of Michaelis 117
154. Brewer's speculum 117
155. Sims's speculum 118
156. Sims's position 118
157. Introduction of Sims's speculum 119
158. Hunter's depressor 119
159. Garrigues's depressor 120
160. How to hold Garrigues's depressor with speculum 120
161. Hymen of woman who has borne one child 121
162. Hypertrophy of vaginal portion in virgin, simulating laceration of cervix 122
163. Sagittal section of a primigravida during last month 123
164. Sagittal section of a plurigravida during last month 124

NORMAL LABOR.

165. Anterior surface of the sacrum and coccyx 131
166. Posterior surface of the sacrum and coccyx 131
167. Lateral edge of the sacrum 132
168. Sacral canal 132
169. Hip-bone, outer surface 133
170. Hip-bone, inner surface 134
171. Horizontal section through sacro-iliac articulation 135
172. Oscillatory movement of the sacrum 136
173. Ligaments of the pelvis 136
174. Horizontal section through symphysis pubis 137
175. Bony pelvis, from above 138
176. Pelvic inlet 139
177. Pelvic outlet 140
178. Inclination of the pelvis 142
179. Axis of pelvis 143
180. Pelvis of new-born child 145
181. Pelvis of child 146
182. Horizontal section through pelvis of new-born child 146
183. Horizontal section through pelvis of adult woman 146
184. Pelvis covered with muscles 148

FIGURE PAGE
185. Posterior wall of pelvic cavity, with pyriformis muscles and sacro-iliac ligaments 149
186. Side view of pelvic cavity, with obturator internus muscle and sacro-sciatic ligaments 149
187. Muscles of the perineum 150
188. Levator ani muscle, from below 151
189. Side view of levator ani 152
190. Pelvic and perineal fasciæ 153
191. Genital canal before labor, pluripara 154
192. Genital canal after the dilatation of the lower uterine segment and the cervical canal, pluripara 154
193. Section through lower uterine segment 154
194. Boundary-line of insertion of ovum 154
195. Parturient canal 155
196. Fetal head, front view 156
197. Fetal head, side view 157
198. Fetal head, from above 158
199. Fetal head, from behind 159
200. True pelvis, life size 160
201. Dilatation of cervix in pluripara 167
202. Dilatation of cervix in pluripara 167
203. Dilatation of cervix in pluripara 167
204. Sagittal section through body of quadripara, stage of dilatation 168
205. Stage of expulsion 169
206. Head pressing on perineum 171
207. Flexion of head 172
208. Internal rotation and extension 173
209. Extension of head 174
210. Extension of head 174
211. Extension of head 174
212. External rotation 175
213. Expulsion of placenta according to Duncan 177
214. Expulsion of placenta according to Baudelocque 177
215. Asymmetry of head born in right occipito-anterior position 178
216. Caput succedaneum 178
217. Hancks's douche-pan 181
218. Fountain syringe 182
219. Inflatable rubber cushion with apron 182
220. Davidson's bulb and valve syringe 183
221. Esmarch's chloroform-mask 183
222. Patient raised on chair, head up 191
223. Patient in left-side position 192
224. Child placed in front of mother's genitals, nurse compressing uterus, doctor cutting cord 195
225. Expression of the placenta 197
226. Extraction of the membranes 199
227. Abdominal binder 200
228. Garrigues's perineal pad 201
229. Patient with all bandages 202
230. New York Maternity Hospital, east elevation 223
231. Same, north elevation 223
232. Same, plan of ground floor 224

NORMAL PUERPERY.

FIGURE PAGE
233. Microscopical appearance of inside of uterus immediately after delivery. 229
234. Sagittal section of the pelvic organs of a puerpera on the second day after delivery 230
235. Sagittal section of the pelvic organs of a puerpera, uterus below brim ... 231
236. Acini of mammary gland during lactation........ 232
237. Microscopical appearance of woman's milk........ 233
238. Breast-pump........ 236
239. Garrigues's breast-bandage........ 238, 239
240. Teufel's abdominal supporter........ 240
241. Soxhlet's sterilizer 250
242. Tarnier's incubator, exterior........ 254
243. Same, interior 255
244. Same, hot-water jug........ 255

ABNORMAL PREGNANCY.

245. Acardiacus 259
246. Abortive ovum expelled with decidua........ 264
247. Transverse sections of the genital cord of a cow........ 277
248. Ovaries, tubes, and uterus, human embryo, tenth week........ 277
249. Urogenital sinus and appendages, human embryo 277
250. Uterus didelphys........ 278
251. Uterus unicornis 280
252. Longitudinal section of the same 281
253. Interstitial inflammation of decidua........ 283
254. Endometritis tuberosa and polyposa........ 284
255. Fritsch's urethral syringe........ 286
256. Oïdium albicans........ 287
257. Trichomonas vaginalis........ 287
258. Vulvar vegetations 290
259. Impaction of retroflexed gravid uterus........ 298
260. Genupectoral position 299
261. Hodge-Emmet pessary 299
262. Interstitial, or tubo-uterine, pregnancy 303
263. Interstitial pregnancy 304
264. Pregnancy in rudimentary horn of uterus unicornis 305
265. Tubal pregnancy........ 306
266. Intraligamentous tubal pregnancy........ 307
267. Syphilitic villus of the chorion........ 341
268. Villi from line of demarcation between healthy and diseased placental tissue........ 342
269. Amniotic bands extending from fœtus to amnion 346
270. Amniotic bands encircling legs of fœtus........ 347
271. Intra-uterine amputation 347
272. Cystic degeneration of villi 350
273. Uterus containing vesicular mole 351
274. Imperfect development of reflexa 352
275. Apoplectic ovum........ 353
276. Fleshy mole 353
277. True knot of cord........ 355
278. Torsion of cord 356

ABNORMAL LABOR.

Unfavorable Position, Presentation, or Attitude.

FIGURE PAGE
279. Birth in occipitoposterior position 363
280. Shape of fetal head in persistent occipitoposterior position 364
281. Shape of head of child born in occipito-anterior position, vertex presentation 364
282. Face presentation due to lateroversion of uterus 368
283. Face presentation, extension and descent 369
284. Face presentation, rotation forward of chin and flexion 370
285. Face presentation in the distended vulva 371
286. Face presentation, persistent mentoposterior position 372
287. Shape of skull, face presentation 373
288. Attitude of child born in face presentation 373
289. Thorn's method of changing face into vertex presentation 374
290. Head of child born in brow presentation 375
291. Lateral flexion of fetal body in pelvic-end presentation 377
292. Normal birth of head in pelvic-end presentation 378
293. Head flexed in pelvic-end presentation 378
294. Legs extended in front of fœtus in breech presentation 379
295. Irregular disengagement of head, pelvic-end presentation 380
296. Liberating posterior arm, breech presentation 382
297. Dorsal displacement of arm across neck, pelvic presentation 383
298. Smellie's method of delivering after-coming head 384
299. Prague method of delivering after-coming head, first step 385
300. Prague method, second step 386
301. Mode of passing fillet over foot 387
302. Olivier's fillet-carrier 388
303. Fillet in groin in sacro-anterior position 388
304. Fillet on thigh in sacroposterior position 389
305. Blunt hook 389
306. Tarnier forceps applied to breech in transverse diameter 390
307. Shape of after-coming head 391
308. Prolapse of arm in transverse presentation 394
309. Spontaneous evolution, first step 394
310. Spontaneous evolution, second step 394
311. Spontaneous evolution, third step 394
312. Spontaneous evolution, fourth step 394
313. Dorsal displacement of arm, vertex presentation 397

Excessive Size of Fœtus.

314. Hydrocephalus 399
315. Skeleton of hydrocephalic fœtus 400
316. Congenital cystic elephantiasis 401
317. Fœtus with distended bladder 401
318. Spina bifida 402
319. Hemicephalus 402

Twin Labor.

320. Twins, vertex presentation 404
321. Twins, one vertex, the other breech presentation 405
322. Locked twins, both head presentation 406
323. Locked twins, breech and head presentations 407

Double Monstrosities.

FIGURE PAGE
324. Dicephalus 408
325. Thoracopagi dissected 409
326. Rose-Marie, dicephalus 410
327. Thoracopagi 411
328. Ischiopagae 411

Abnormalities of Ovum.

329. Repositor for prolapsed umbilical cord 416
330. Elevated-pelvis position on inverted chair 416
331. Retained placenta 418

Obstructions in the Parturient Canal.

332. Anterior sacculation of uterus 421
333. Posterior sacculation of uterus 422
334. Partial prolapse of gravid uterus 423
335. Prolapse and hypertrophy of cervix, head presentation 423
336. Conglutination of the external os 424
337. Cervix-scissors 427
338. Pediculated myoma obstructing labor 429
339. Retrocervical fibromyoma filling pelvis 430
340. Head arrested at brim by ovarian cyst 432
341. Fibrous polypus of cervix occupying vagina 434

Deformities of Pelvis.

342. Relation between the diagonal conjugate and the available conjugate ... 441
343. Relation between the diagonal conjugate and the available conjugate ... 441
344. Relation between the diagonal conjugate and the available conjugate ... 441
345. Double promontory 441
346. Generally contracted pelvis, male type, from above 445
347. Same, front view 446
348. Adult pelvis with infantile type 447
349. Pelvis of reclination 447
350. Simple flat pelvis 448
351. Rhachitic flat pelvis 449
352. Rhachitic flat pelvis with strongly curved sacrum 450
353. Rhachitic flat pelvis with convex sacrum 450
354. Rhachitic pelvis with heart-shaped brim 451
355. Rhachitic skeleton 452
356. Engagement of vertex in flat pelvis 453
357. Pelvis with dislocation of both femora 457
358. Deep depressions on presenting head 460
359. Deep depressions on after-coming head 460
360. Pressure marks on skin of skull and face 461
361. Scoliotic-rhachitic pelvis 468
362. Obliquely contracted pelvis, or Naegele pelvis 469
363. Coxalgic pelvis 472
364. Ankylosed transversely contracted pelvis, or Robert pelvis 475
365. Kyphotic pelvis from above and front 477

FIGURE PAGE
366. Same from behind and below 478
367. Pelvis obtecta 481
368. Funnel-shaped pelvis 482
369. Vertical section of osteomalacic pelvis 483
370. Woman with osteomalacia 484
371. Osteomalacic pelvis, front view 485
372. Same from below 485
373. Osteomalacic pelvis 486
374. Pseudo-osteomalacic pelvis, front view 489
375. Same from above 489
376. Spondylolisthetic pelvis 490
377. Normal lumbar vertebra 491
378. Lumbar vertebra with elongated interarticular portion 491
379. Patient with spondylolisthesis 492
380. Patient with spondylolisthesis 492
381. Patient with spondylolisthesis 492
382. Osteoma of sacrum 493
383. Enchondroma of sacrum 494
384. Pelvis without symphysis pubis 495
385. Pelvis without sacrum 495

Hemorrhage.

386. Central placenta prævia 497
387. Cervical placenta prævia 499
388. Placenta descending to boundary-line of greatest expansion of os 501
389. Rupture of circular sinus 508
390. Incomplete inversion of uterus 517
391. Complete inversion of uterus 518
392. Superficial vaginal hæmatoma 524

Rupture of Organs.

393. Rupture of uterus 528
394. Pressure necrosis of uterus 532
395. Laceration of perineum and vagina 537
396. Central laceration of perineum 538
397. Serre-fine 542
398. Knee-bandage 544

Injury to Child.

399. Double cephalæmatoma 554
400. Schultze's swingings 560
401. Schultze's swingings 560

OPERATIONS.

Dilatation of Cervix, Curettage, Induction of Premature Labor, Injections.

402. Hanks's cervical dilator 566
403. Goelet's expanding dilator 567
404. Garrigues's olive-shaped dilators 567
405. Robb's leg-holder 568
406. Garrigues's weight speculum 568

FIGURE PAGE
407. Schroeder's vaginal retractor........ 568
408. Sims's sharp curette........ 569
409. Simon's sharp curette........ 569
410. Récamier's dull curette........ 569
411. Thomas's large dull wire curette........ 569
412. Placenta-forceps, heart-shaped jaws........ 570
413. Placenta-forceps, oval jaws........ 570
414. Garrigues's single-current soft-metal intra-uterine tube........ 571
415. Barnes's cervical dilators........ 573
416. Forceps for carrying bags or gauze into the uterus........ 574
417. Peterson's colpeurynter........ 575
418. Champetier de Ribes's cervical dilator........ 575
419. Bag in grip of forceps........ 576
420. Garrigues's intra-uterine glass tube with attachment........ 577
421. Garrigues's apparatus for transfusion and infusion........ 582
422. Philander Harris's method of manual dilatation of the cervix........ 585
423. Arthur Müller's cervical dilator........ 588
424. Hanging posture of Walcher........ 592

Forceps Delivery.

425. A. R. Simpson's axis-traction forceps........ 595
426. Handle of the same........ 595
427. Chamberlen's forceps........ 596
428. Levret's forceps........ 597
429. J. Y. Simpson's forceps........ 597
430. Naegele's forceps........ 598
431. Lock of the same........ 598
432. Elliott's forceps........ 598
433. Hodge's forceps........ 599
434. Tarnier's forceps held as used for traction........ 600
435. Same without the traction-handle........ 600
436. A. R. Simpson's new model........ 602
437. Component parts of the same........ 602
438. Left branch of forceps guided by right hand........ 608
439. Mode of holding forceps during traction........ 609
440. Another way of holding forceps........ 610
441. Forceps on head at brim........ 612
442. Forceps on head at outlet........ 612
443. Axis-traction forceps held with full hand in delivering head........ 615
444. Facial paralysis of new-born child........ 617

Version.

445. Cephalic version by Braxton Hicks's method........ 620
446. Podalic version by Braxton Hicks's method, first step........ 621
447. Podalic version by Braxton Hicks's method, second step........ 622
448. Podalic version by Braxton Hicks's method, third step........ 622
449. Podalic version by Braxton Hicks's method, fourth step........ 623
450. Podalic version by Braxton Hicks's method, completed........ 624
451. Cephalic version by Busch's method........ 625
452. Cephalic version by D'Outrepont's method........ 626
453. Podalic version by internal manual method, head presentation........ 630

FIGURE PAGE
454. Podalic version with prolapsed arm 631
455. Way of seizing foot 631
456. Seizing leg of same side as presenting shoulder 632
457. Seizing opposite leg 632
458. Making a noose with one hand, first step 633
459. Making a noose with one hand, second step 633
460. Carrying noose on fingers 634
461. Braun's fillet-carrier, or repositor for prolapsed cord 634
462. Routh's fillet-carrier 635
463. Double manœuvre for dislodging head 636

Symphyseotomy.

464. Veins of prevesical space 644
465. Triangular ligament of urethra 645
466. Diagram of fasciæ of pelvic floor 646
467. External erectile organs 647
468. Galbiati's falcetta 648
469. Same, modernized 648
470. Hay's director 649
471. Harris's method of opening symphysis, front view 650
472. Same, side view 650
473. Curved, probe-pointed bistoury used in Garrigues's first case 651
474. Garrigues's symphyseotomy-bandage 653

Embryotomy.

475. Naegele's perforator 678
476. Thomas's perforator 679
477. J. Y. Simpson's cranioclast 680
478. Braun's cranioclast 680
479. Braxton-Hicks's cephalotribe 681
480. Thomas's craniotomy-forceps 682
481. Tarnier's basiotribe 683
482. A. R. Simpson's basilyst 683
483. Crotchet 684
484. Braun's key-hook 685
485. Same, applied 686

ABNORMAL PUERPERY.

486. Dissecting metritis 703
487. Lymphatics of uterus 704
488. Lymphangeitis and lymphothrombosis of uterus 705
489. Formalin disinfector 723
490. Exploratory vaginal aspirator 736
491. Garrigues's blunt expanding perforator 736
492. Sky-rocket drainage-tube 736
493. Double soft-rubber drainage-tube with cross-bar 736
494. Deciduoma malignum 752
495. Chorio-epithelioma malignum 753
496. Section through pelvic organs of patient with chorio-epithelioma malignum of uterus and vagina 754
497. Milk of anæmic woman 760

FIGURE PAGE
498. Milk of woman fifteen months after childbirth 760
499. Nipple-shield 763
500. Another nipple-shield 763
501. Glandular mastitis forming abscess 767
502. Desmarre's eyelid retractors.. 805
503. Director for tongue-tie.. 826
504. Navel button.. 829

A

TEXT-BOOK OF OBSTETRICS

NORMAL DIVISION.

PART I.—FOUNDATION.

THE science of obstetrics is the knowledge of the history of man from the moment of his conception to the time he is weaned, including diseases commonly observed during the first few days of the child's life; but, as a rule, information about the child in health and disease after its mother recovers from childbirth is left to works on hygiene and pædiatrics. Obstetrical art is the aid to be given to mother and child during pregnancy, labor, and the puerperal state. The word *obstetrics* is derived from the two Latin words *ob* and *stare*, to stand in front of, referring to the position of the obstetrician in Rome, where women were delivered sitting on a chair made for that purpose.

CHAPTER I.

PUBERTY.

WOMAN can conceive only during a certain part of her life. Puberty and the climacteric mark the beginning and the end of her fruitful period. Puberty is the change from childhood to womanhood. It is a gradual development which generally, in the temperate zone, takes place in the fourteenth or fifteenth year of the girl's life. At that time the breasts become larger, the uterus increases in size, the hips become broader, and the contour of the whole body is rounded out by an increase of adipose tissue. The external genitals and the armpits become covered with a growth of hair, menstruation appears, and the two sexes, who hitherto rather shunned and even despised each other, now begin to feel a mutual attraction.

CHAPTER II.

NUBILITY.

THOUGH puberty ushers in the period when woman can conceive, it does not follow that it would be proper and desirable for her to become impregnated at this early stage of development. For instance, in East India, where child marriages are practised on religious grounds, they often lead to sterility; and even in our own latitudes statistics show a much larger mortality among married women under twenty years of age than later. It is evidently against the laws of nature for a woman to become a mother before her own body is fully developed. The uterus should have reached the size it has in the adult; the pelvis should have acquired the necessary dimensions for the safe passage of a child through its canal; the abdominal muscles should be strong enough to assist the uterus in bringing forth the fruit from its interior to the surrounding world; and the breasts should be fit to nurse the child after its severance from the maternal body; not to speak of the mental maturity that is requisite for bringing up a child in a civilized community. It may, therefore, be stated in a general way that most women should not marry before they are twenty years old.

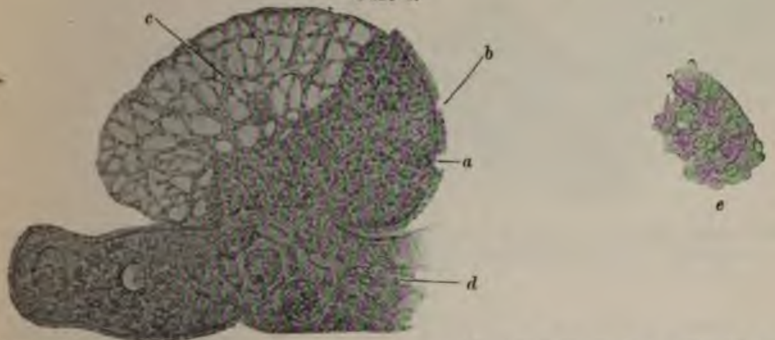
Generally the fruitful period of woman comprises about thirty years, between the ages of fifteen and forty-five years; but exceptionally pregnancy and childbirth are observed much earlier or later than these limits. The writer has examined a girl at full term who was only thirteen years old, and a case has been reported where pregnancy began in the eighth year and was followed by childbirth in the ninth. On the other hand, childbirth has been observed at the age of sixty-two years.

CHAPTER III.

OVULATION AND THE OVUM.

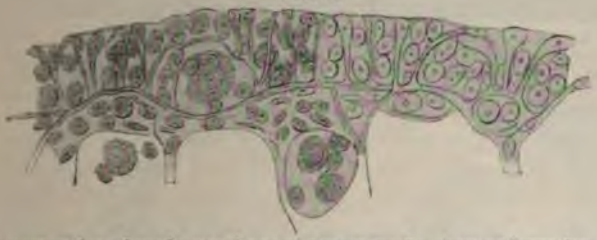
EMBRYOLOGY teaches us that at the earliest stage the ovary is represented by a heap of cells, the *germ epithelium*, rising from that portion of the peritoneum which covers the Wolffian body, and that soon a protuberance of connective tissue grows from behind into this mass of cells. These two elements build up the whole ovary, the cells producing the parenchyma, or glandular element, and the connective tissue furnishing the stroma in which the former is embedded. Prolongations of connective tissue grow in between the cells, so as to separate them into groups and form a roof over them; but from this layer sprout new prolongations, while new cells are constantly formed on the surface. In this way are formed irregular tubes which intercommunicate, much like the canals in a sponge (Figs. 1, 2, 3, 4). Finally, the whole surface is covered only with a single layer of cells, the *columnar epithelium* of the ovary, under which is found a layer of connective tissue, the future *albuginea*, and under that, again, clusters of cells surrounded by connective tissue (Fig. 5), or sometimes a long row of large cells, each surrounded by smaller cells, until all these columns and clusters are broken up into small compartments, each containing one large cell and one or more smaller ones (Fig. 6).

FIG. 1.



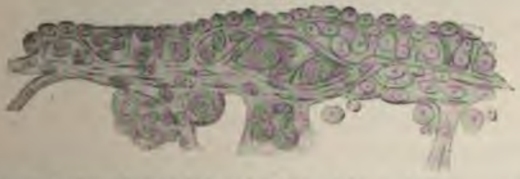
Ovary of human fœtus of ten or eleven weeks. (H. Meyer.) *a*, superficial stratum of cells; *b*, layer of connective tissue; *c*, trabeculæ of connective tissue, the cells having been removed; *d*, mesoarium; *e*, part near surface, seen with higher power; *n*, natural size of the whole specimen.

FIG. 2.



Part of ovary near surface, from human fœtus of sixteen weeks, showing formation and separation of ova. (H. Meyer.)

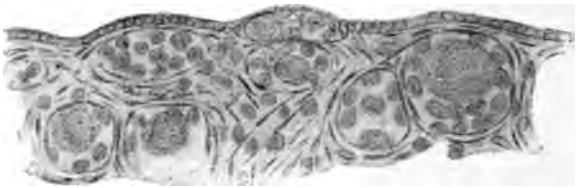
FIG. 3.



Part of ovary near surface, from human fœtus of twenty-eight weeks. In some places appears the permanent epithelium, composed of a single layer. (H. Meyer.)

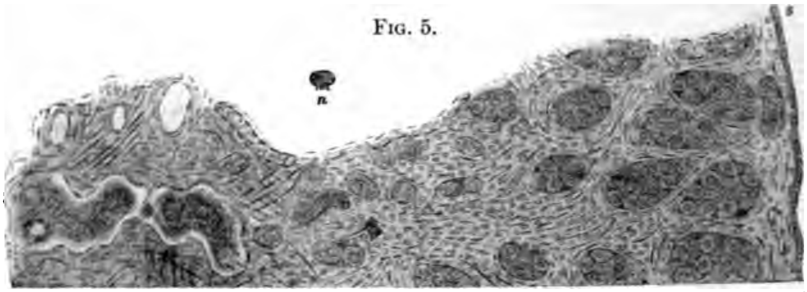
The large cells have each a nucleus and a nucleolus and are the future ova. They are called *primordial ova.* According to Waldeyer,

FIG. 4.



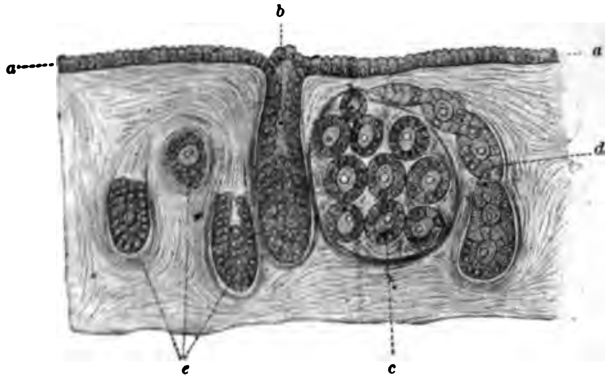
Part of ovary near surface, from human fœtus of thirty-six weeks. The single layer of epithelium is interrupted by a belated primordial ovum with its follicular epithelial cells. (H. Meyer.)

FIG. 5.



Part of section from surface to hilum of ovary of girl three days old. (H. Meyer.) *s*, single layer of epithelium, still in connection with cluster of primordial ova. All ova have disappeared from the surface. A broad layer of stroma separates in most places the epithelium from the follicular zone. The farther we go from the surface the fewer ova are there in one nest, until, finally, there is only one enclosed in its primary follicle. *n*, natural size of the whole ovary.

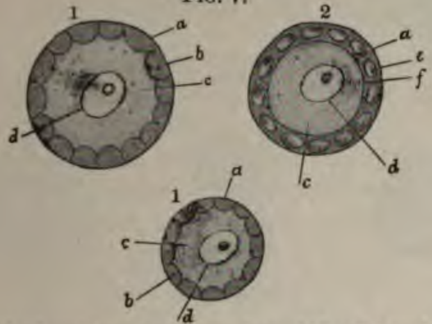
FIG. 6.



Perpendicular section through the ovary of a bitch of six months. Hartnack $\frac{3}{7}$. (Waldeyer.) *a*, epithelium; *b*, epithelial pouch opening on the surface; *c*, larger group of follicles; *d*, tube filled with ova, each surrounded by smaller cells; *e*, oblique and transverse sections of tubes. It is noticeable that some of the cells are large, others small.

the small cells multiply and form the epithelial lining of the *primary follicles* (Fig. 7), which are the rudimentary Graafian follicles. According to Foulis, however, these epithelial cells of the follicles are due to a transformation of the surrounding connective tissue.

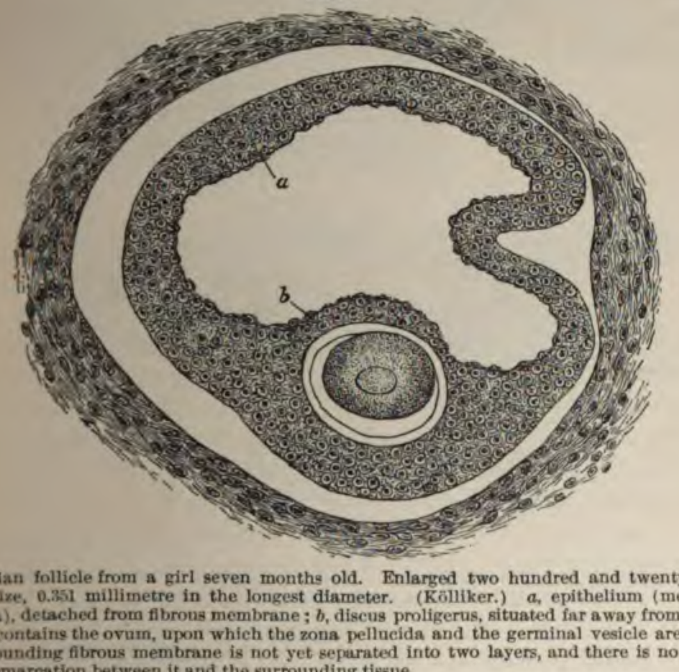
FIG. 7.



Three Graafian follicles from the ovary of a new-born child. Enlarged three hundred and fifty times. (Kölliker.) 1, natural condition; 2, treated with acetic acid; *a*, structureless membrane; *b*, epithelium (membrana granulosa); *c*, yolk; *d*, germinal vesicle with germinal spot; *e*, nuclei of the epithelial cells; *f*, vitelline membrane.

The small cells increase in number and form several layers. A fissure is formed between them, and a fluid accumulates in the

FIG. 8.



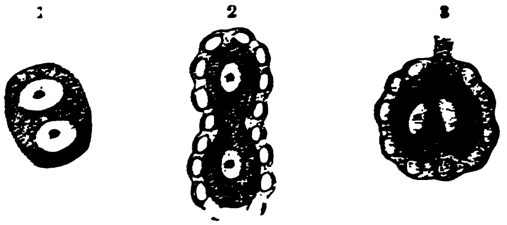
Graafian follicle from a girl seven months old. Enlarged two hundred and twenty times; natural size, 0.351 millimetre in the longest diameter. (Kölliker.) *a*, epithelium (membrana granulosa), detached from fibrous membrane; *b*, discus proligerus, situated far away from the surface. It contains the ovum, upon which the zona pellucida and the germinal vesicle are visible. The surrounding fibrous membrane is not yet separated into two layers, and there is no distinct line of demarcation between it and the surrounding tissue.

interior, the beginning of the future *liquor folliculi*. The outer layers constitute the epithelium of the Graafian follicle, the so-called *mem-*

brana granulosa; the inner continue to surround the ovum, forming a protuberance on the inner surface of the follicle, called the *discus proligerus* (Fig. 8).

The formation of ova from the surface epithelium of the ovary ceases from the time the single layer of cells is formed, which takes place about the end of the seventh month; but it seems that the ova themselves multiply by division (Fig. 9).

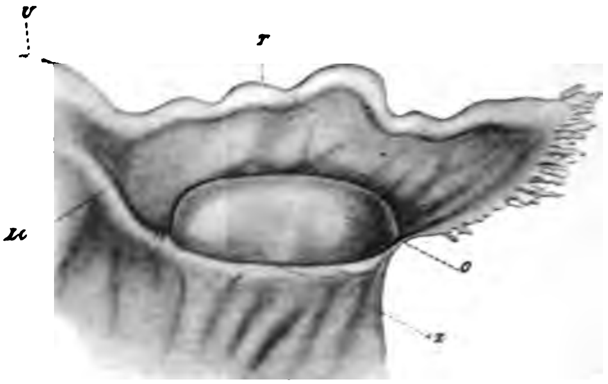
FIG. 9.



Primordial ova undergoing division, from a human embryo of six months. Enlarged four hundred times. (Kölliker.) (1, primordial ovum with two nuclei (germinal vesicles); 2, two primordial ova, linked together by a band of protoplasm, the whole surface being surrounded by a single layer of epithelium; 3, two primordial ova, surrounded by a common layer of epithelium; one ovum has a prolongation by means of which it probably was attached to another ovum.

The number of ova in the new-born is enormous. It has even been computed to be seventy-two thousand in the two ovaries, a superabundant provision, indeed, for the preservation of the human race on earth, when we take into consideration the fact that probably only one or two ova are loosened once a month during a period of thirty years.

FIG. 10.

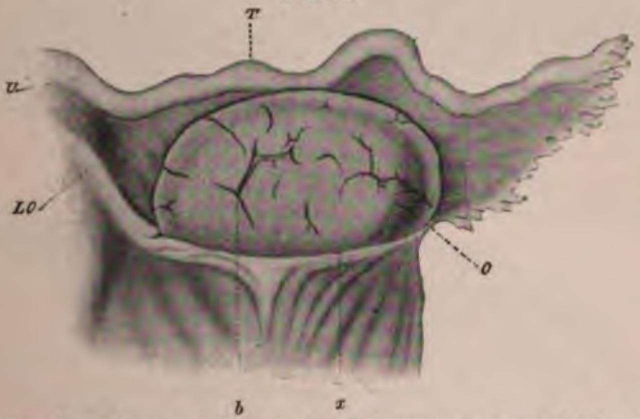


Ovary and tube of a nineteen-year-old girl. (Waldeyer.) U, uterus; T, tube; LO, ovarian ligament (unusually long); o, ovary; x, limit of peritoneum.

In mammalia the process of ovulation—that is, the expulsion of ova—is perfectly known. Before each recurrence of rut one or more Graafian follicles ripen and burst. The ovum is expelled and enters the Fallopian tube, through which it is propelled by the movement of the cilia of the epithelium into the uterus. If copulation takes place, the ovum meets a spermatozoid and is nearly always fertilized. In the ovaries are found a number of corpora lutea corresponding to that of the fœtuses.

In woman the anatomical construction of the ovaries is much like that of the ovaries of mammals. They are covered with a single layer of hexagonal columnar cells, forming their epithelium. In the young girl the ovary is smooth and soft (Fig. 10). Later, each ovulation leaving a small cicatrix, the surface becomes a little puckered (Fig. 11), and in old age it becomes uneven, hard, nearly cartilaginous, and in places the epithelium is lost.

FIG. 11.

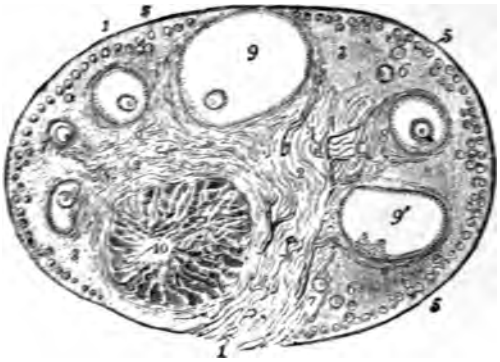


Ovary and tube of a girl twenty-four years old. (Waldeyer.) *U*, uterus; *T*, tube; *LO*, ovarian ligament; *o*, ovary; *x*, limit of peritoneum; *b*, cicatrices of ruptured Graafian follicles.

Even macroscopically the ovarium shows on its cut surface two different component parts,—an outer, called the *parenchymatous zone* or *cortical substance*, and an inner, called the *vascular zone* or *medullary substance*. Under the microscope more layers appear. Under the epithelium lies the *albuginea*, in which three layers are distinguishable, forming a resistant fibrous membrane with interspersed smooth muscle-fibres. Under the albuginea is found a zone containing numerous small follicles, called *ovisacs* or primary *Graafian follicles*. Inside of this zone is found another, with much larger follicles in different stages of development. The tissue in which these follicles, small and large, are embedded consists chiefly of smooth muscle-fibres and connective tissue, arranged so as to form circles around each follicle.

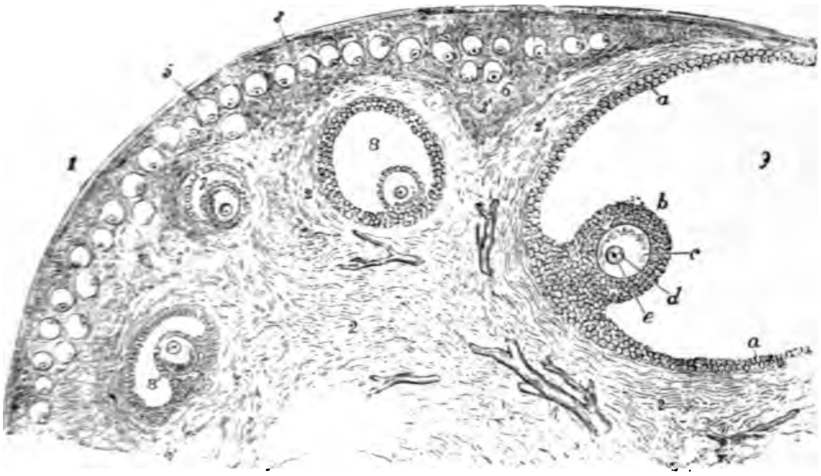
The medullary zone is composed of similar elements, but is much softer and contains large blood-vessels. The largest vessels are found near the hilum; towards the surface they are smaller and surround each follicle with a fine capillary net-work (Figs. 12, 13, 14, 15).

FIG. 12.



Section of the ovary of a cat. Enlarged six times. (Schrön.) 1, outer covering (epithelium and albuginea); 1', attachment to broad ligament; 2, vascular zone or medullary substance; 3, parenchymatous zone or cortical substance; 4, blood-vessels; 5, Graafian follicles in their primary stage lying near the surface; 6, 7, 8, more advanced follicles, embedded more deeply in the stroma; 9, an almost mature follicle, containing the ovum in its deepest part, most remote from the surface; 9', a follicle from which the ovum has accidentally disappeared; 10, corpus luteum.

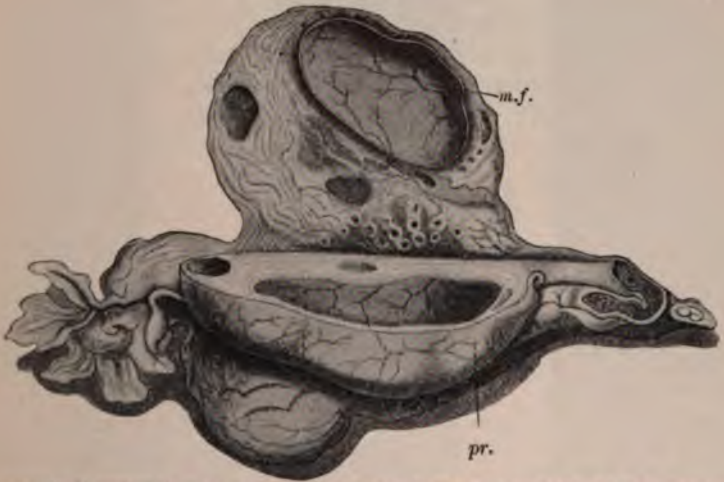
FIG. 13.



Part of the same section of the ovary of a cat seen in Fig. 12. Enlarged about twenty-four times. (Schrön.) 1, the epithelium and albuginea; 2, fibrous and muscular stroma; 3, less fibrous, more superficial stroma; 4, blood-vessels; 5, small Graafian follicles, situated near the surface; 6, a few more deeply placed; 7, one further developed, showing the internal epithelium of the Graafian follicle, the discus proligerus, the ovum, with the germinal vesicle and germinal spot, and the fissure between the epithelium of the ovum and that of the follicle; the follicle is surrounded by stroma arranged in a circle and communicating with that of the vascular zone; 8, a more advanced stage, the membrana granulosa showing several layers; 9, part of the largest follicle; *a*, membrana granulosa; *b*, discus proligerus; *c*, ovum; *d*, germinal vesicle; *e*, germinal spot.

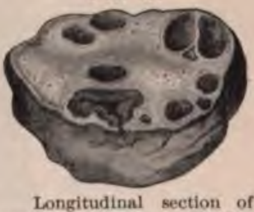
The small follicles, measuring from 0.02 to 0.08 millimetre, are the same primary follicles found in the developmental age, but of the enormous number comparatively few are left. This gradual diminution of ovisacs appears distinctly in the three cuts represented in Fig. 16, which gives a comparative view of the ovaries of a new-born child, a girl four years old, and a woman of twenty. The large follicles are more properly called Graafian follicles, and can be seen with the naked eye as vesicles of the size of peas (Figs. 14, 15). There are from six to twenty of them in each ovary. The follicles do not change place. It is only by their growth that they push the surrounding tissue aside and sink down into the deeper parts of the ovary, at the same time that they approach the surface. They may attain the size of a large hickory-nut or a small English walnut. Finally, on the most prominent point all the tissue between the follicle and the surface of the ovary atrophies, and a slight force, be it a contraction of the muscular tissue encircling the follicle or an increased rush of blood to the ovary, suffices to cause the rupture of the follicle. At the same time the liquor folliculi escapes, carrying with it the ovum, still surrounded by some of the cells of the discus proligerus.

FIG. 14.



Longitudinal section through ovary of a woman twenty-two days after the last menstruation. (Leopold.) *m.f.*, mature Graafian follicle; *pr.*, most prominent point of follicle, where the rupture may be expected.

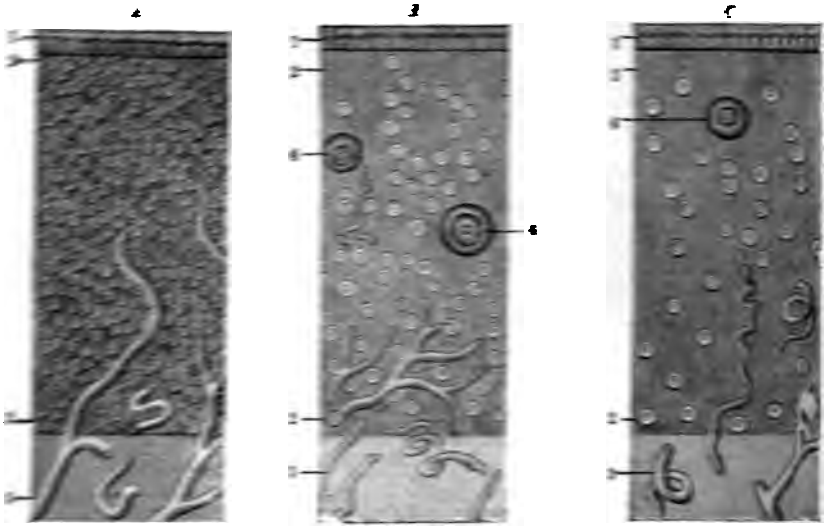
FIG. 15.



Longitudinal section of ovary of a woman on the first day of menstruation, with one burst follicle opening on the surface and other follicles in different stages of development. (Leopold.)

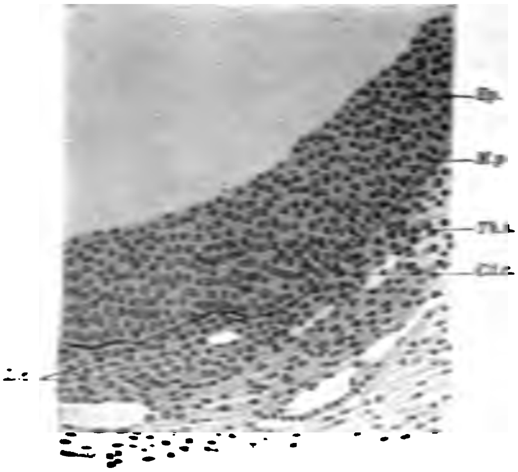
The wall of the fully developed Graafian follicle consists of two layers, called *theca externa* and *theca interna*, and inside of the latter

FIG. 16.



Perpendicular section of the cortical substance of the ovary: A, in the new-born; B, in a girl four years old; C, in a woman of [illegible] years. 1, columnar epithelium; 2, cortical substance; 3, medullary substance; 4, more developed follicles, with distinct ova.

FIG. 17.



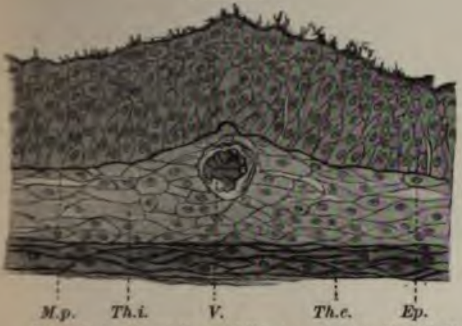
Part of wall of young Graafian follicle of a pig. Enlarged two hundred times. (J. G. Clark.) The transition from primary connective tissue to lutein-cells is seen. The membrana propria forms a sharp dividing line between the epithelial cells (membrana granulosa) and the follicle wall. *Ep.*, epithelium; *M.p.*, membrana propria; *Th.i.*, theca interna; *Ct.c.*, connective-tissue cells; *L.c.*, lutein-cells.

there is a structureless membrane called *membrana propria*, which appears before the two other layers have been formed (Fig. 17).

After being ruptured the follicle collapses, or is sometimes filled with blood that coagulates. The structureless membrane breaks in several places, and the cavity is invaded by the so-called *lutein-cells*, which are transformed connective-tissue cells, first appearing in the theca interna (Fig. 18). A fine net-work of connective tissue fills the cavity of the follicle, which becomes nearly as large as before its rupture, but this period of increase does not extend beyond ten days. Near the wall the cells lie in folds, but they soon undergo fatty degeneration and the connective tissue shrinks. The fatty degeneration gives rise to a yellow color, which has caused the follicle at this stage to be called a *corpus luteum*,—*i.e.*, yellow body (Fig. 19).

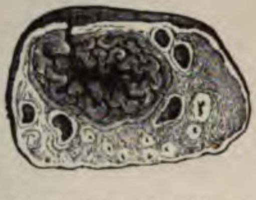
Gradually the fibrous tissue is absorbed through hyaline degeneration, until a very fine scar-tissue is left, which at last is lost in the ovarian stroma. At the end of eleven weeks its volume measures only one-twentieth of a cubic centimetre. As a rule, we find in an ovary three or more such corpora lutea in different stages of growth or retrogression. Each such process leads, however, to some hardening of the ovarian tissue, until in the course of time the outer parts of the stroma become so dense that circulation stops in the periphery and thus an end is put to the development of new follicles.

FIG. 18.



Follicle in about the middle stage of growth. (J. G. Clark.) *Ep.*, epithelium; *M.p.*, membrana propria; *Th.i.*, theca interna with well-differentiated lutein-cells; *Th.e.*, theca externa; *V.*, blood-vessel.

FIG. 19.

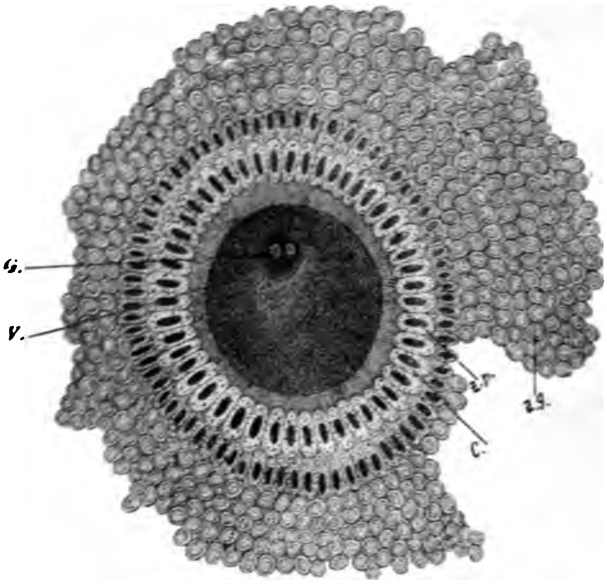


Ovary of woman, with corpus luteum and Graafian follicles, fifteen days after the last menstruation. (Leopold.)

If pregnancy occurs, no new corpora lutea are produced, but the last one formed becomes larger and remains longer visible. It continues to grow for thirty or forty days and occupies two-thirds of the ovary, being about three centimetres in length. In the centre of the yellow convolutions is found a firm, fibrinous, white mass, which sometimes has a central cavity filled with a serous fluid. Beyond a certain period of pregnancy (about the end of the third month), the corpus luteum diminishes in size and loses some of its bright-yellow color. It is still found at the end of pregnancy, but is then reduced in volume to half a cubic centimetre. Finally, it disappears at the end of the first month after childbirth. The difference as to size, construction, and persistence between the corpus luteum of pregnancy and that of menstruation must be borne in mind in deciding whether a woman upon whom a legal autopsy is being performed was or had recently been pregnant or not.

We do not know with certainty if the expulsion of an ovum is connected with menstruation in women as it is with the rut in animals: but it is very likely that a follicle ruptures immediately before the menstrual flow commences.

Fig. 20.



Human ovum removed from the discus proligerus of a Graafian follicle eight millimetres in diameter. (Nagel.) *G.*, germinal vesicle with double germinal spot; *V.*, vitellus; *Z.p.*, zona pellucida; *C.*, corona; *Z.g.*, zona granulosa (part of discus proligerus, which, again, is a part of the membrana granulosa, forming the epithelium of the follicle).

The expelled ovum falls into the abdominal cavity, and reaches the abdominal ostium of the tube through the current produced by the vibration of the cilia on the fimbriæ of the Fallopian tube, which mechanism has been proved experimentally by injecting the eggs of ascarids into the upper part of the abdominal cavity of a rabbit. In ten hours they were found in the tubes.

We know also, from experiments on animals and pathological conditions in women, that an ovum can wander from the ovary on one side to the tube on the other,—so-called *external migration of the ovum.* In opposition to this, *internal migration of the ovum* means the passage of the ovum from one ovary through the tube and uterine cavity into the opposite tube. It is uncertain whether such a thing is possible in woman; and even in animals it has only been proved by observation and experiment that an ovum can migrate from one horn of a bicornute uterus to the other.

The human ovum (Fig. 20) is a little globular body, averaging 0.2 millimetre in diameter, and just visible with the naked eye. The nearest cells of the discus proligerus form around it a regular double layer of elongated cells, the so-called *corona*. The ovum has a membrane with radiating striæ, called *zona pellucida* or *vitelline membrane*. The interior is filled with a semifluid mass, the *vitellus*. This is composed of larger clear bodies, minute dark ones, and one much larger vesicle, the *germinal vesicle*, in which is found a little round body, the *germinal spot*. The last-named contains a few dark granules, and sometimes similar bodies are found in the germinal vesicle outside of the germinal spot. The whole ovum is a cell, the zona pellucida its membrane, the vitellus its contents, the germinal vesicle its nucleus, and the germinal spot its nucleolus.

CHAPTER IV.

MENSTRUATION.

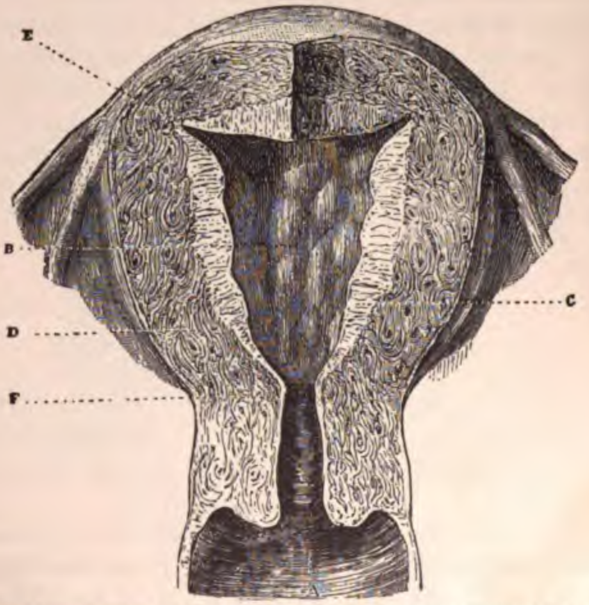
MENSTRUATION is the discharge of blood from the cavity of the uterus, recurring at regular intervals. It is also called the *menses*, the *catamenia*, the *menstrual period*, the *monthly sickness*, the *monthly flow*, *courses*, or *turns*.

This phenomenon is peculiar to woman and some species of apes. It is probably due to the erect position usually maintained by mankind and these animals, which necessitates a harder consistency of the womb and excludes the presence of the enormously developed lymphatic system which is found in the flabby uteri of animals walking on four feet.

The menstrual flow commences in most women in the temperate zone between the fifteenth and seventeenth years of their lives. It begins earlier in warm climates than in cold, earlier in cities than in the country, and earlier in the higher walks of society than among the lower classes. It returns in periods of twenty-eight days, and lasts on an average four days. The amount of blood evacuated varies much, but four or five ounces are said to be the average. It is increased by bodily exercise, corporeal work, and the internal use of alcohol and iron. The menstrual blood differs from that from other sources by a more or less considerable admixture of epithelial cells and mucus and by a peculiar "heavy" odor. It is secreted by the mucous membrane of the uterus and probably the tubes, while the cervix has no part in its production. Before the appearance of the flow the woman has a sensation of heaviness or pressure in the lumbar region, and often her breath has an unpleasant and characteristic odor during the period.

If menstruation has been evolved from the rut in mammalia, it has changed much in character. While female animals admit the male only during the period of heat, woman not only has an aversion for sexual intercourse during menstruation, but the act performed during the catamenial period exposes both sexes to disease. As a rule, menstruation ceases during pregnancy and lactation, but exceptions to these rules, especially the latter, are by no means rare.

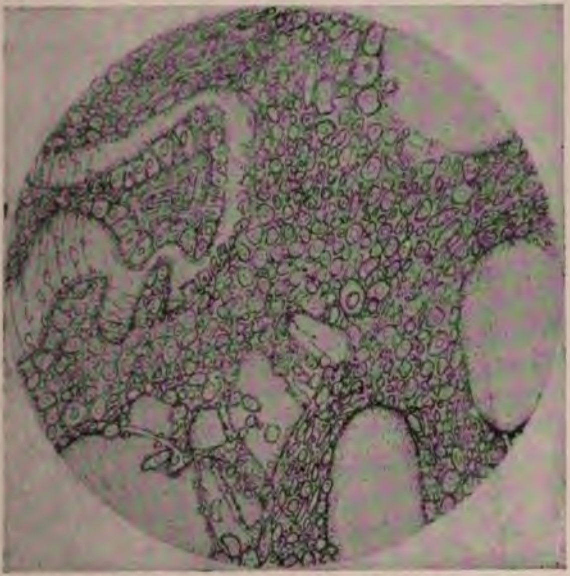
FIG. 21.



Uterus during menstruation. (Courty.) Cut open to show the swelling of the whole organ, particularly the mucous membrane. *A*, mucous membrane of the cervix; *B* and *C*, mucous membrane of the corpus, much thickened; *D*, muscular layer; *E*, uterine opening of the Fallopian tube; *F*, os internum.

The anatomical base of menstruation is a regularly recurrent development of the endometrium (Fig. 21). About a week before the menstrual flow sets in, the mucous membrane of the uterus begins to swell, so that its thickness increases from one-eighth of an inch to one-quarter of an inch in the middle of the side walls and the fundus, from which points it tapers towards the three openings leading to the tubes and the cervix. In consequence of the disproportion between it and the surrounding muscular coat, its surface becomes wavy. The arteries become much enlarged and form spiral windings. Under the epithelium the capillaries become so much enlarged that they form a plexus discernible with the naked eye. On the other hand, the mucous membrane contains only few and small veins. The utricular glands become much wider and longer, forming spiral or zigzag tubes. The interglandular connective tissue is filled with numberless small round cells, like lymph-corpuscles, and giant cells containing many nuclei (Fig. 22). These corpuscular elements are found in much smaller number during the intermenstrual period, and are formed from granules in the threads of connective tissue making up the bulk of the mucous membrane or by scission of one cell into two (Fig. 23).

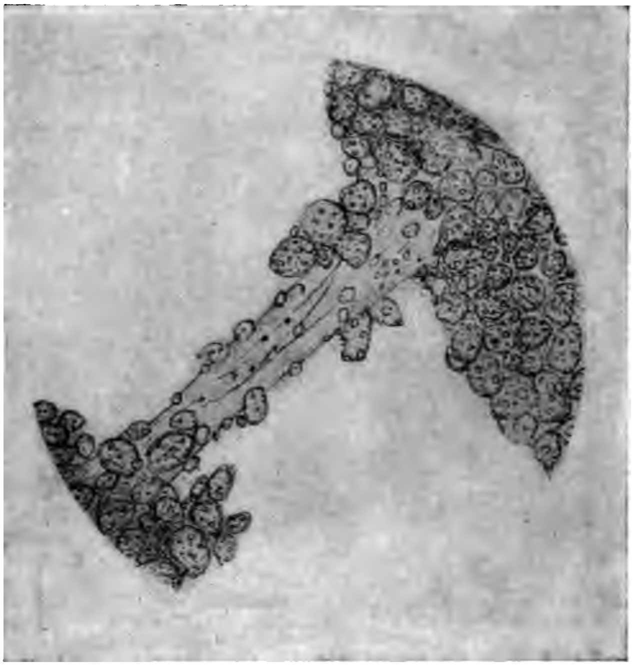
FIG. 22.



Section of the endometrium of a menstruating woman, showing lymph-corpuscles and utricular glands denuded of or shedding their epithelium. Enlarged eight hundred times. (A. W. Johnstone.)

Before the menstrual period the blood-pressure in the arteries of the whole body is increased. Microscopists do not yet agree on the question whether an actual rupture of the blood-vessels and the epithelium takes place, or the blood oozes out through the intact wall of the capillaries and the epithelium by diapedesis; but the former seems much more likely, even after it has been proved that the whole epithelium is not thrown off, as was formerly taught. There are extravasations into the tissue of the mucous membrane, which in some places lift the epithelium and cause it to rupture, giving escape to the blood. The utricular glands shed the epithelium in the portion situated nearest to the free surface. The flow lasts four or five days, and then the work of repair and retrogression begins, which takes only about four days for its accomplishment, so that the whole process from beginning to end requires about fifteen days, or fully one-half of the time elapsing between the beginning of one menstruation and the commencement of the next. The swelling subsides; the utricular glands become shorter, narrower, and straighter, and are again covered with epithelium in their full extent. The capillary net shrinks, the small wounds heal, and most of the lymph-like bodies disappear.

FIG. 23.



Fibre of endometrium, showing different degrees of development from granules to cells. Enlarged three thousand times. (Johnstone.)

The mucous membrane of the tubes participates in the process of menstruation. It swells and secretes a thin bloody fluid containing blood-corpuscles and epithelial cells.

As stated above, authors differ in regard to the connection between menstruation and ovulation; but even if the exact moment of the expulsion of the ovum in woman is unknown, and it is not proved whether it precedes, accompanies, or follows menstruation, numerous autopsies and laparotomies have shown that there is a correspondence between the time elapsed since the beginning of the last menstruation and the degree of development of the largest corpus luteum. That there is some connection between menstruation and ovulation is also corroborated by the clinical fact that abortive ova have never been found corresponding in development to the period between the last menstruation and the day the next was due.

The cause of menstruation is still unknown. Since it returns in regular intervals, there can hardly be any doubt that it is regulated by some centre in the central nervous organs. We may surmise that the growth of the Graafian follicle exercises a pressure on the ends of the ovarian nerves which is transmitted to that centre, and that this sends out an impulse resulting in the development of the uterine mucous membrane and the rupture of vessels. It is probably the same increased blood-pressure that causes the rupture of a ripe Graafian follicle in the ovary and of the capillaries in the mucous membrane of the uterus.

In some of his patients the writer has noticed a regular alternation between the two ovaries, one becoming swollen at the time of menstruation and the next month the other, and so forth; but it is not known if such a regular alternation is found in healthy women. The fact is, however, that we, as a rule, find only one fully developed or ruptured follicle corresponding to a menstruation.

The supposition that the impulse to menstruation starts from the ovaries is corroborated by the fact that when we tie the pedicle of the ovary and remove it the patient nearly always has a bloody discharge from the uterus, and by the other fact that in the vast majority of cases the removal of both ovaries leads to a premature menopause. According to A. W. Johnstone, menstruation is a physiological necessity in women and erect animals, because there are not lymphatic vessels enough to carry off the enormous surplus of lymph-corpuscles produced during the preparation of the womb for the possible event of conception. In its swollen condition the mucous membrane of the uterus is called *decidua menstrualis*, in contradistinction from *decidua graviditatis*, the same membrane during pregnancy.

Before leaving the subject of menstruation, we shall add that it is not found invariably: women enjoying perfect health may go through life without menstruating, and they may even give birth to children. Childbirth may also occur years after the monthly flow has stopped,—the so-called *menopause*. In diseased conditions the non-appearance of the menstrual flow is quite common,—so-called *amenorrhœa*.

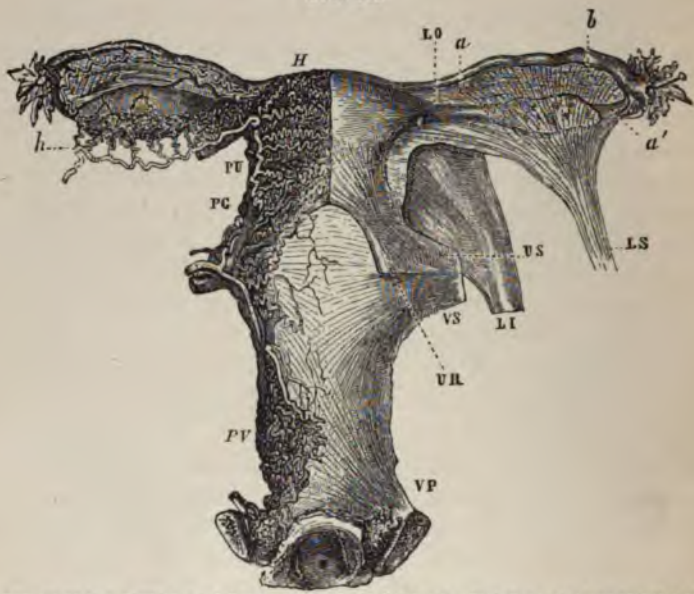
Aveling has aptly called the growth of the menstrual decidua *nidation* and its retrogressive stage *denidation*, a nest being built for the reception and protection of the fertilized ovum, and destroyed if none appears.

CHAPTER V.

COPULATION.

Copulation is the act of union of the male and female genitals. On the part of the male it is dependent on erection, a stiffening of the penis. In the woman also an erection takes place under normal circumstances, the clitoris becoming enlarged and curved against the dorsum penis, the vestibulo-vaginal bulb entering into a state of turgescence, and the inner genitals becoming the seat of a stasis of blood in consequence of the intimate connection between the round ligament and the platysma of the broad ligament with the superior or lumbar round ligament, which accompanies and envelops the ovarian vessels (Fig. 24). But, whereas erection is a *conditio sine qua non* in man, it is not so in woman. Copulation may take place even while she is unconscious and entirely relaxed.

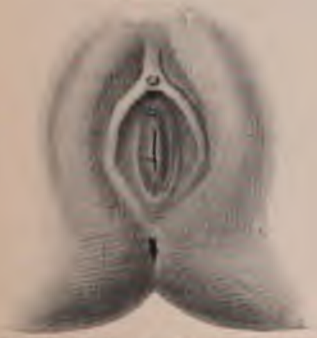
Fig. 24.



The vessels of the vagina and internal genitals in their relation to the superficial muscular structures. (Rouget.) The specimen is seen from behind. Vascular system: *PV*, vaginal plexus; *PC*, cervical plexus; *PU*, uterine plexus; *H*, helicine arteries of the fundus uteri; *h*, helicine arteries of hilum of ovary. Muscular system: *VP*, insertion of the muscle-bundles of the vagina on the pubes; *VS*, bundles of the same muscular coat coming from the region of the sacro-iliac articulation; *US*, uterine muscle-bundles which accompany the preceding and constitute to a great extent the posterior layer of the broad ligament; *UR*, recto-uterine or sacro-uterine ligament; *LI*, inguinal, or pubic, round ligament, spreading over the whole anterior surface of the uterus; *a*, muscular bundles coming from the ovarian ligament (*LO*), spreading and interlacing with *b*, the bundles coming from the superior, or lumbar, round ligament (*LS*), in the interior of the ovary, and beyond in the ala vespertilionis, before they are inserted on the tube and the fimbriæ; *a'*, bundles starting from the ovary, which together with others coming directly from the superior round ligament form the fimbria ovarica.

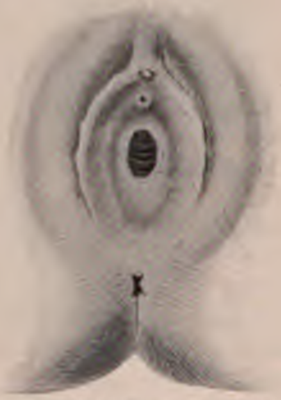
The vagina is the organ destined by nature to receive and form a "sheath" around the male organ, as a scabbard encompasses a sword, the Latin word having this meaning. It is not superfluous, as it may seem to some, to dwell on this point. The writer has repeatedly examined women who, although they had been married for years to apparently strong men, presented untorn, sharply resisting hymens. Sometimes, but not always, this condition is explained by an abnormal laxity of the urethra, so that the examining finger of the gynæcologist and the male organ during copulation find less resistance there than at the entrance of the vagina, the result of which is that copulation takes place in the urethra and the bladder without the parties knowing their mistake.

Fig. 25.



Hymen with linear opening. (Tardieu.)

Fig. 26.



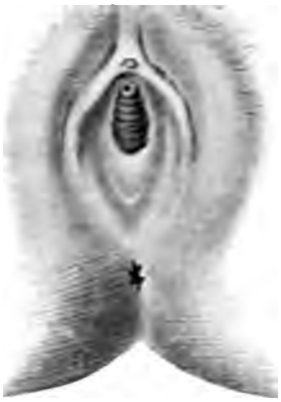
Annular hymen. (Tardieu.)

The hymen normally has different shapes. The most common, especially in childhood, is that of a strip of mucous membrane bent so as to form two lateral halves, touching each other in a straight middle line (Fig. 25). In other cases it forms a ring with a round opening,—annular hymen (Fig. 26). In others, again, it has the shape of a crescent (Fig. 27). Often the border is indented (Fig. 28).

The hymeneal opening being much smaller than the part it is destined to admit, at the first complete copulation the hymen is torn in one or more places, forming two or more flaps (Fig. 29). This laceration is accompanied by considerable pain and some loss of blood, which may acquire the character of a hemorrhage and call for surgical interference. In order to facilitate intromission and save the virgin unnecessary pain, it is well to lubricate the male organ with white vaseline. From a diagnostic stand-point it should be remembered that a careless gynæcological examination may have on the hymen an effect similar to that of copulation.

Many young married couples do themselves a great deal of harm by over-indulgence in sexual gratification. Even in cases where there was no element of infection, the writer has seen serious inflammation of the vagina, uterus, tubes, and ovaries follow such foolish conduct. For the pure girl the approach of man is painful, accompanied by wounds, and the emotional shock is enormous. She ought, therefore, to be treated with the greatest care and be spared all brutality.

Fig. 27.

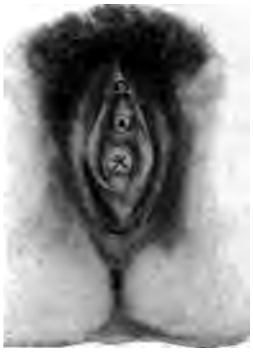


Crescent-shaped hymen.

The proper position for man, different from that of most animals, during the act of copulation is chest to chest, with bent knees, the male covering the female. If, however, the husband is of unusual weight, it is better or necessary for him to occupy the lower position. If intercourse takes place during advanced pregnancy, it should be in the lateral position, chest to back, so as to avoid all pressure on the gravid uterus.

Friction between the male and female copulative organs causes a voluptuous sensation which normally ends in *orgasm*, the acme of nervous excitement, which seems to be weaker in woman than in man, and is totally absent in many women, who nevertheless may conceive and bear children. The orgasm is accompanied by the ejaculation of the semen in man and of a mucous fluid in woman. If orgasm is weaker in woman than in man, it also weakens her much less than him, a difference that is easily explained by the different composition of the two fluids ejected and the profound shock sustained by the central nervous system in the male.

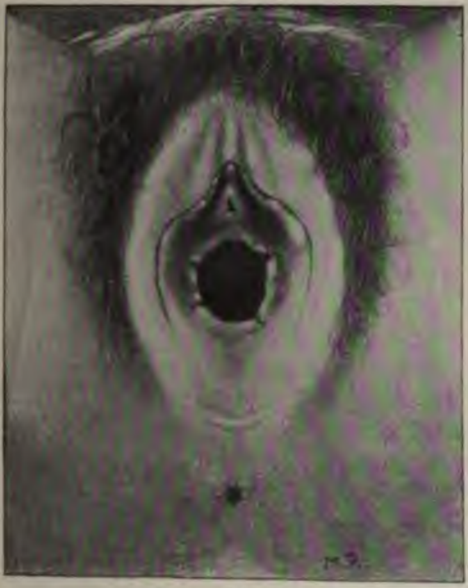
Fig. 28.



Indented hymen.

It is not quite certain whether part of the semen ejaculated enters the womb directly during the act of copulation. The round ligaments are so disposed that they may adapt the cervical canal to the meatus urinarius so as to form a prolongation of the male urethra, and several observers have seen the cervix open wide during orgasm accidentally brought on by a gynæcological examination. In this way suction might be exercised by the uterus itself, and the semen would be drawn into its interior, besides being injected by contraction of the perineal muscles in the male. But this is probably quite exceptional, and under ordinary circumstances the spermatozoids doubtless enter the uterus by their own movements, which are very lively and powerful and all go in one chief direction, as if seeking a predestined goal. They consist in wavy lateral flexions and extensions of the tail.

Fig. 29.



Ruptured hymen.

That the part the uterus plays in conception cannot be a very active or essential one appears from the well-authenticated cases in which pregnancy occurred in spite of the nearly total occlusion of the vagina due to the presence of a transverse partition.

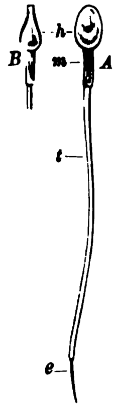
CHAPTER VI.

FECUNDATION.

Fecundation, fertilization, conception, or impregnation consists in the union of the two generative elements, the spermatozoid and the ovum, by which in the latter begins the formation of a new individual.

The spermatozoids are formed by scission and further development of the epithelial cells of the seminal canals of the testicles, each cell producing a whole bundle of spermatozoids. In shape they much resemble a tadpole. They are composed of an oval, somewhat pointed head, a short middle piece, and a long, thin tail, with a still finer end-piece (Fig. 30). The total length is about 0.04 millimetre, or one-fifth the diameter of the ovum. Spermatozoids, as a rule, appear in boys at the age of fifteen or sixteen years, and are constantly reproduced. While woman's fruitful period ceases comparatively soon, there are numerous examples of men being capable of procreation when between seventy and eighty years old, and perhaps the faculty is normally preserved till the end of life. In the adult one or two fluidrachms of semen are ejaculated, each drop of which contains myriads of spermatozoids.

Fig. 30.



Human spermatozoids. (Retzius.) *A*, front view of a spermatozoid; *B*, side view; *h*, head; *m*, middle piece; *t*, tail; *e*, end piece.

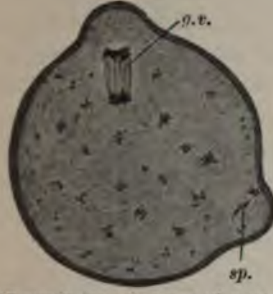
Probably the two elements, as a rule, meet each other in the Fallopian tube, although the well-authenticated cases of ovarian pregnancy prove that the human ovum may be fertilized while it is still embedded in the ovary; and in mammalia the spermatozoids are found on it within twenty-four hours after coition, showing how rapidly they pass through the uterus and tube, although the direction in which the cilia of the mucous membrane of these organs move is opposed to the penetration of the spermatozoids and all in favor of the transport of the ovum to and through the uterus.

We know that a single coition at any time may result in the impregnation of a woman, but experience has shown that the likelihood of such an event is much greater shortly before or shortly after menstruation than midway between the end of one and the beginning of the next period. Of the two terms that preceding the menstrual flow seems, again, to offer the best chance for impregnation. In the young embryo the development takes place with such rapidity that an interval of three weeks makes an enormous difference in the condition of the organs. In this way it was found that three-fourths of the young embryos corresponded to the first skipped menstruation, and only one-fourth to the end of the preceding, but the whole number of the examined ova is too small to exclude the possibility of accidentals.

The fact that a woman may be impregnated at any time, however, does not prove that an ovum is detached in the same moment, for both ova and spermatozoids may be preserved for some time in fruitful condition in the genital canal. The human ovum has been found on the fourth day of menstruation in the uterine part of the tube, and in another case one and a quarter inches above the internal os.

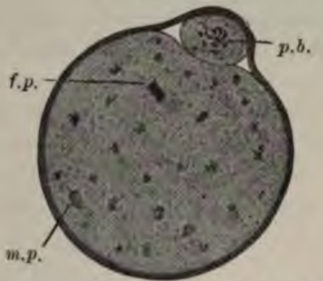
How long it stays in the uterus and preserves its capability of becoming fecundated is unknown. In animals the ovum loses this faculty when it has left the upper part of the tube. It seems, therefore, very improbable that in woman it should preserve this faculty for weeks after it has left the ovary, whereas no fact is known that would conflict with the supposition that the human spermatozoids

Fig. 31.



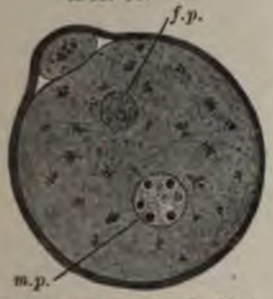
Fecundation of ovum of a mouse. *g.v.*, germinal vesicle; *sp.*, head of spermatozoid.

Fig. 32.



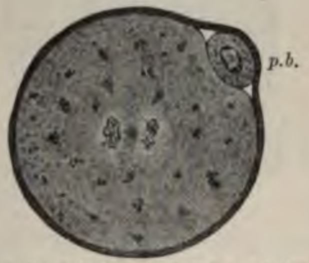
Separation of polar body (*p.b.*); *f.p.*, female pronucleus; *m.p.*, head of spermatozoid.

Fig. 33.



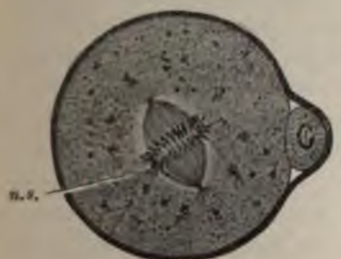
Ovum with the female (*f.p.*) and male (*m.p.*) pronuclei more developed and nearer to each other.

Fig. 34.



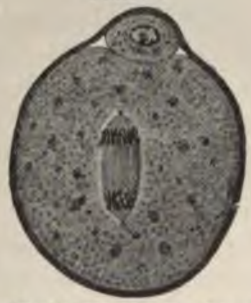
Formation of chromatin fibres and the centrosoma. *p.b.*, polar body.

Fig. 35.



n.s., nucleus of segmentation.

Fig. 36.

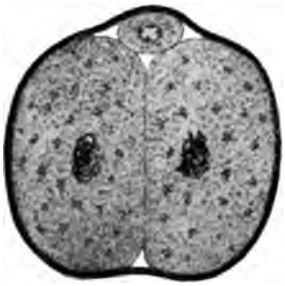


Karyokinesis preparing the first fission.

keep their vitality for weeks in the folds of the ampulla, and such possibility is absolutely proved to exist in animals.

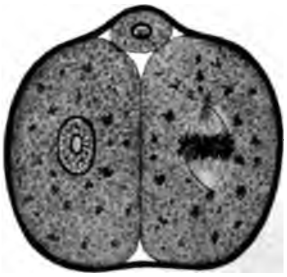
How the union of the male and female germs takes place in woman is not known, but there is every reason to believe that the process is essentially the same as that observed directly with the microscope in animals. Figs. 31–38 illustrate the changes in the ovum of a mouse (Sobotta). As a rule, one spermatozoid suffices for the fecundation of the ovum. It perforates the zona pellucida of the ovum, enters the vitellus, and throws off its tail (Fig. 31). Ere this a karyokinetic process has taken place in the germinal vesicle, a part of the stainable mass having arranged itself into the shape of a ball of cord, forming two *polar bodies*, or *directing globules*, or *extrusion globules* (in the mouse only one), and being pushed towards the surface of the ovum. That portion of the stainable mass which is not used for the formation of the polar bodies becomes the *female pronucleus* (Fig. 32), while the head of the spermatozoid swells and becomes the *male pronucleus*. Both these pronuclei increase considerably in stainable matter and approach each other (Figs. 33, 34) until they blend, forming one body, the *nucleus of segmentation* (Fig. 35), which by mitosis separates into two, around which the vitellus forms two masses called *blastomeres*, the direction of the fission being determined by the position of the directing bodies. In the same way each of the two blastomeres is separated by mitosis into two segments, so as to form four in all. By continued division the number is repeatedly doubled, and the globules gradually take the appearance of true cells, the whole process being a very rapid one. In rabbits *segmentation*, which is the technical term designating the breaking up of the vitellus into parts or segments, begins two hours after the union of the male and the female pronucleus and is accomplished within from seventy to seventy-five hours, by which time the ova have passed through the tube and entered the uterine cavity.

Fig. 37.



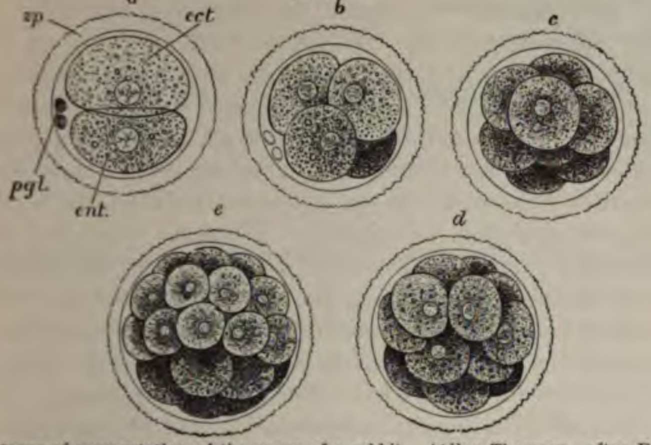
End of first fission.

Fig. 38.



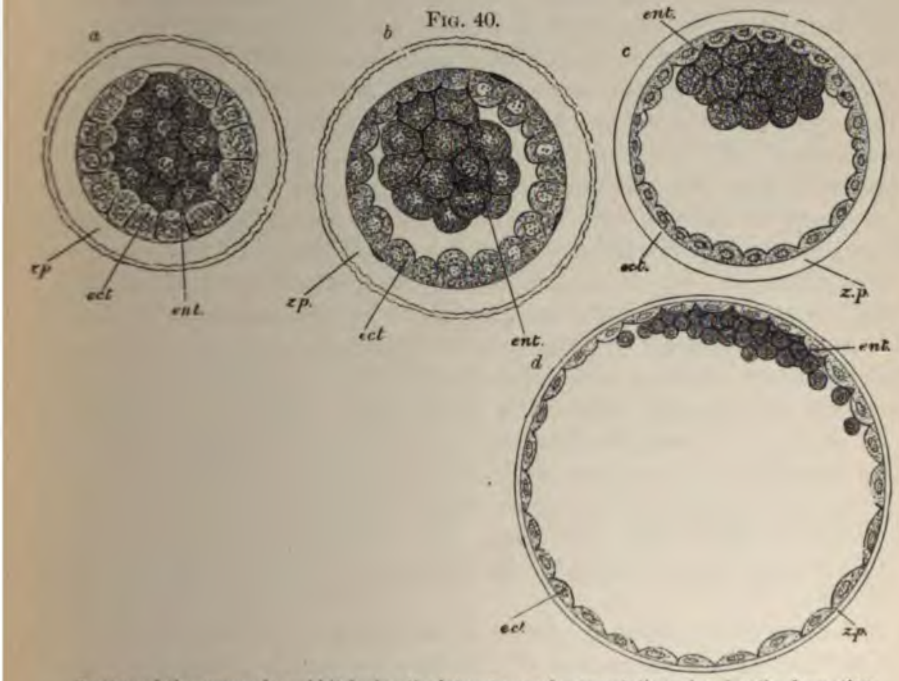
Two blastomeres, one in a state of mitosis, preparing for second segmentation.

FIG. 39.



First stages of segmentation of the ovum of a rabbit. (Allen Thomson, after Edward van Beneden's description.) *zp*, zona pellucida; *pgl*, polar globules; *ect*, ectomere; *ent*, entomere; *a*, division into two blastomeres; *b*, stage of four blastomeres; *c*, eight blastomeres, the ectomeres partially enclosing the entomeres; *d* and *e*, succeeding stages of segmentation, showing the more rapid division of the ectomeres and the enclosure of the entomeres by them.

FIG. 40.



Section of the ovum of a rabbit during the later stages of segmentation, showing the formation of the blastodermic vesicle. (Edward van Beneden.) *a*, enclosure of entomeres by ectomeres, except in one spot; *b*, more advanced stage, in which fluid is beginning to accumulate between the entomeres and ectomeres; *c*, fluid has increased much, a large space separating them, except in one place; *d*, blastodermic vesicle; *zp*, zona pellucida; *ect*, ectodermic cells; *ent*, entodermic cells.

From the very beginning a difference is noticed between the upper and the lower segment, the former, the *ectomere*, being larger than the latter, the *endomere* (Fig. 39). When the third stage, where there are eight spheroids, is reached, the lower four form a round mass and the upper show a tendency to surround them. A difference in the rate of division becomes apparent, the upper set multiplying faster than the lower. At the same time the upper spheroids show more and more tendency to spread over the lower set, until finally, in the tenth stage, they enclose them completely. There are ninety-six segments in all, of which sixty-four are those of the surface, the *ectoderm*, and thirty-two those of the interior, the *entoderm* (Fig. 40). The whole mass is called *morula*, on account of its likeness to a mulberry. Next a serous fluid begins to accumulate between the endomeres and ectomeres, except in one part, where they remain in contact. Thus the ovum, which is only slightly increased in size, is transformed to a vesicle, to which at a later period the name *blastodermic vesicle* is given.

PART II.—NORMAL PREGNANCY.

CHAPTER I.

TRANSPORTATION AND EMBEDDING OF THE OVUM. DECIDUA.

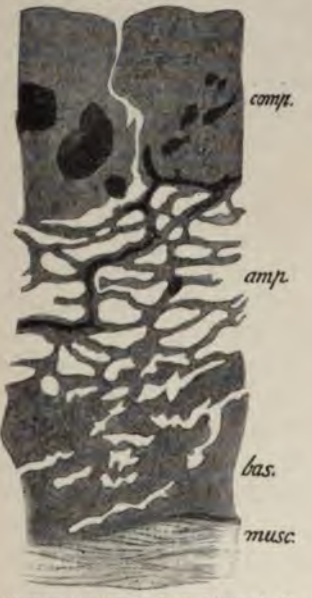
THE fertilized human ovum has never been found on its passage from the Graafian follicle to the uterus. Nor do we know how long the transfer takes. The youngest fertilized ova known must, according to their degree of development and analogy from animals, be referred to the end of the first or the beginning of the second week (ova of Peters and Merttens). One supposed to be twelve or thirteen days old (ovum of Reichert) was already totally embedded in the mucous membrane of the uterus.

It takes the fertilized ovum of woman probably about a week to cover the distance from the ovary to the uterus. Its presence acts as a powerful stimulus on the latter, especially on the uterine mucous membrane. This becomes much thicker, even half an inch in depth, and is called the *decidua of pregnancy*, in contradistinction to that due to a similar process which takes place on a smaller scale at every menstrual period and is called the menstrual decidua. The increase in volume is due to the enlargement of the blood-vessels and the utricular glands. A perpendicular section of the decidua of pregnancy (Fig. 41) shows three layers. Near the surface is a *compact layer*, in which the glands have nearly preserved the course they follow outside of pregnancy and in which are seen greatly enlarged veins; outside of that a very loose layer formed chiefly by the much widened and elongated glands, the course of which has become zigzag and irregular, —the *ampullar layer;* and, finally, a somewhat firmer layer, containing the deepest parts of the glands,—the *basic layer*.

The arteries are spiral-shaped. The surfaces of the anterior and the posterior wall of the uterus show furrows and protuberances, which give it a puckered appearance (Fig. 42). The microscope reveals the presence of peculiar large cells with a large nucleus,—the so-called *decidual* cells.

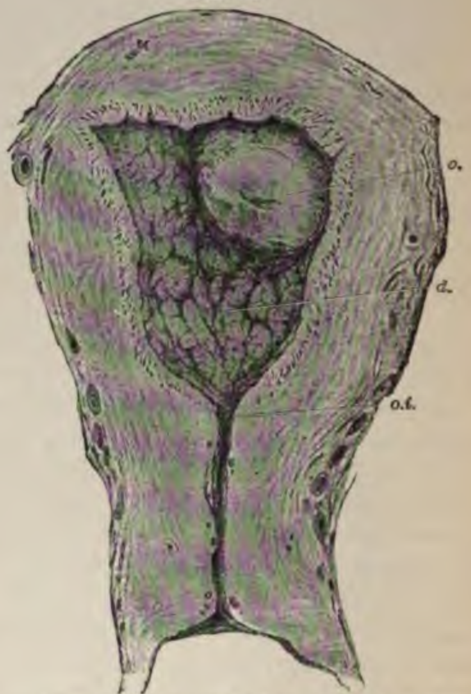
What relations are there between the menstrual decidua and that of pregnancy? Since we cannot kill women, as we do rabbits, at various stages after impregnation, this will probably always remain a secret, and we can only draw on our imagination and reasoning to fill out the gaps in our actual knowledge. When we take into consideration the great likeness between the two deciduæ,—one being, as it were, a pocket edition and the other an *édition de luxe* of the same work,—it seems highly probable that the one is a development of the other. Remembering the clinical fact that pregnancy is most apt to occur shortly before menstruation, we can imagine that the fertilized ovum is deposited on the well-prepared mucous membrane, such as it is before every menstruation, and that then the process takes on larger proportions until the decidua of pregnancy is formed. Furthermore, inasmuch as the next best period for fertile copulation is that shortly after the cessation of menstruation, we may suppose that the condition of the mucous membrane, although less favorable than before the menstrual flow occurred, in its swollen and succulent condition still offers a comparatively good soil for the development of the fertilized ovum. If, finally, we bear in mind the fact that midway between two menstruations is the time in which pregnancy is least likely

FIG. 41.



Perpendicular section through the mucous membrane of a pregnant uterus. (Langhans.) *musc.*, muscular coat; *bas.*, the basal layer of the decidua; *amp.*, the ampullary or glandular layer of the decidua; *comp.*, the compact layer of the decidua.

FIG. 42.

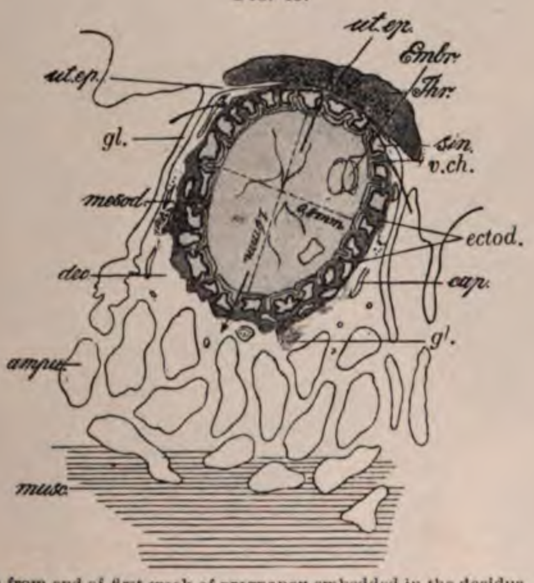


Uterus with decidua in beginning pregnancy. (Ruge.) *o.i.*, internal os; *o.*, ovum, covered by decidua reflexa; *d*, decidua vera.

to occur, it is probable that the fertilized ovum, not finding a propitious soil, is destroyed and lost. In those cases in which only one coition has taken place and pregnancy has developed, although the event occurred at a period far from the preceding and the following menstruation, we may suppose that there was no Graafian follicle ripe at the time of intercourse, that rupture occurred later, and that the spermatozoids remained alive in the Fallopian tube until an ovum came and was fecundated by the union with one of them.

However this may be, when pregnancy begins, the fertilized ovum is, as a rule, arrested near the internal opening of one of the Fallopian tubes, tissue grows up around it from the surface of the mucous membrane of the uterus, and soon closes over it, so as to embed it entirely. In the youngest human ovum known—that of Peters (Fig. 43)—we see the very act of embedding, the ovum being flanked by glands and resting on glands, but covered only by uterine epithelium, in which there still was an opening communicating with the uterine cavity.

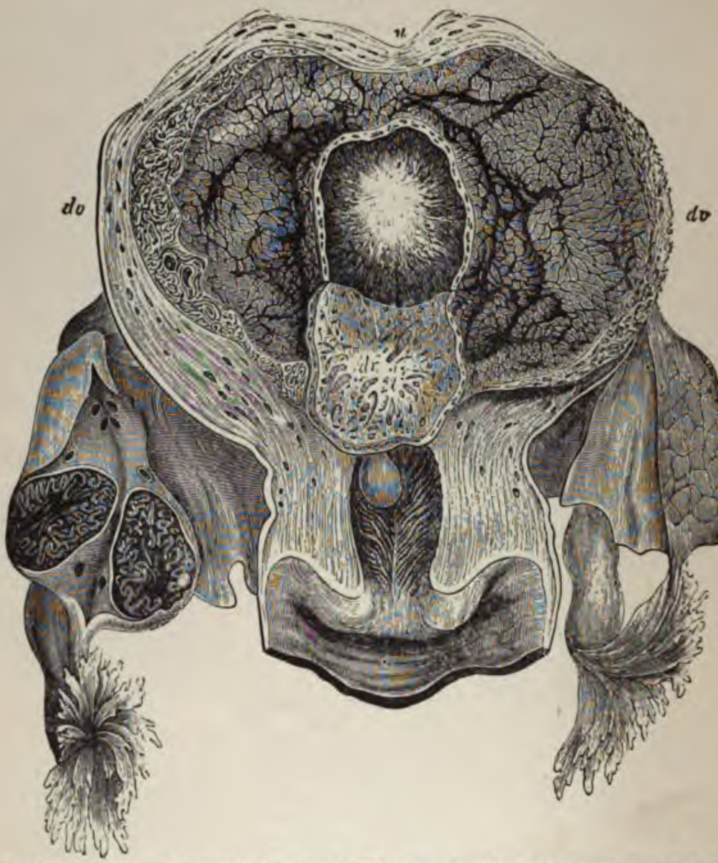
FIG. 43.



Human ovum from end of first week of pregnancy embedded in the decidua. (Peters.) *ut.ep.*, uterine epithelium; *Embr.*, embryo; *sin.*, blood-spaces between the villi of the chorion; *ectod.*, ectoderm; *dec.*, decidua; *ampu.*, ampullary layer of decidua; *musc.*, muscular layer of uterus; *Thr.*, thrombus, composed of red blood-corpuscles and ectoderm-cells; *v.ch.*, villi of the chorion; *cap.*, capillary; *gl.*, gland; *mesod.*, mesoderm, or mesoblast.

When the ovum grows, this part of the decidua, which covers it, forms a hood, called *decidua reflexa*, while that portion of the decidua situated between the uterus and the ovum is named *decidua serotina*, in opposition to which two that portion which lines the whole uterine cavity and is not at first in contact with the ovum is called *decidua* *vera* (Fig. 44). The word *decidua* means a membrane that is shed; the terms *reflexa* (bent back) and *serotina* (late coming) date from a time when it was thought that the ovum carried the whole mucous membrane in front of itself, reflecting it, or turning it back; and that a new layer of decidua was formed later, which closed the ovum in from behind. Corresponding to our present knowledge of the process, new names have been proposed: decidua reflexa is called *decidua capsularis*, and decidua serotina, *decidua basilaris;* but the old names have remained in more common use.

FIG. 44.



Interior of pregnant uterus at the twenty-fifth day. Decidua reflexa cut open to show ovum, covered with villi of the chorion. (Coste.) *dv*, decidua vera with enlarged uterine glands; *u*, uterine wall; *dr*, decidua reflexa, opened and turned down, showing pitted inner surface; right ovary, cut open, shows corpus luteum with folds.

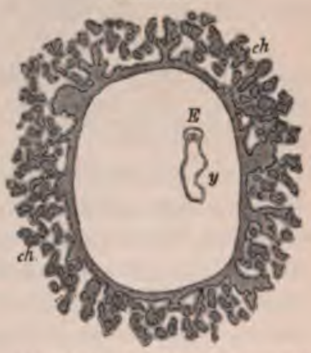
The decidua vera continues to grow thicker and the uterus as a whole increases in mass until the end of the third month, but after that the decidua and the whole uterine wall become gradually thinner. The decidua reflexa also grows thicker in the beginning, but is soon expanded by the growing ovum, and at the end of three months does not measure over a millimetre in thickness. It has no epithelium and its blood-vessels disappear in the course of the first three months of pregnancy. The vera also loses its epithelium and vera and reflexa coalesce more or less completely, so that the former cavity of the uterus ceases to exist, a process which begins towards the end of the third month and is finished in the sixth month. At the same time the cervical canal is closed by a large plug of thick mucus.

CHAPTER II.

CHORION.

THE ovum in the ripe Graafian follicle measures on an average 0.2 of a millimetre, and the youngest fertilized ovum found in the uterus, probably one week old, measured in its longest diameter 1.6 millimetres,—that is to say, in about eight days it had become eight times longer. The above-described segmentation takes place in mammalia, and probably in woman, during the passage through the Fallopian tube. At the same time small branches sprout from the zona pellucida of the ovum, constituting what is called the *primitive chorion*, which probably offers some advantages for the passage of the ovum along the ciliated surface of the tubal epithelium; but it soon disappears and is replaced by the true *chorion*, a membrane of great importance in the history of the development of the ovum and the fœtus, since it is instrumental in forming the connection between the ovum and the uterus, the fœtus and the mother. It consists of two layers, an external one composed of epithelial cells, the *exochorion*, and an inner one, formed of fetal connective tissue, the *endochorion*.

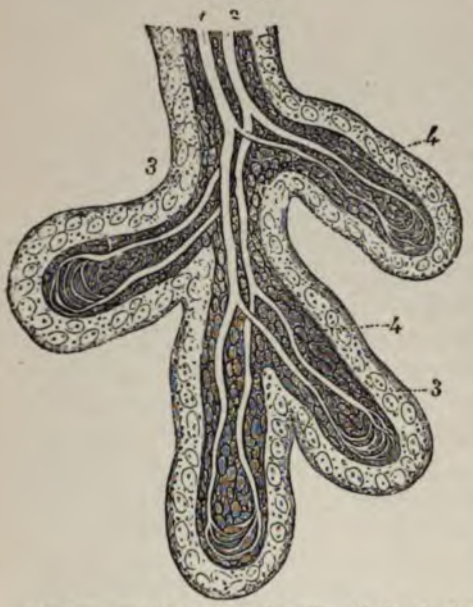
FIG. 45.



Section through human ovum of about two weeks. (Strahl.) *E*, embryo; *y*, yolk-sac; *ch*, villi of chorion.

The whole surface of the ovum becomes covered with sprouting prominences, which subdivide, forming little arborescent tufts inserted with a thin pedicle on the membrane of the chorion, the so-called *villi of the chorion* (Fig. 45). These villi consist of an internal stroma of connective tissue and a double layer of epithelial character. The inner is called the *ectoderm*, and consists of well-defined cells, each with a nucleus; the outer is called the *syncytium*, and is a continuous mass of protoplasm with numerous interspersed nuclei in the interior and hair-like excrescences on the outer surface. Opinions are divided as to the origin of this layer, some believing it to be developed from the epithelium of the uterus, while others think it is formed from the ectoderm. Probably both the epithelial layers of the villi are of fetal origin, but it is impossible to draw a sharp line of demarcation between the fetal and the maternal sphere. The two epithelial layers are not found uniformly all over the surface of the villi; on the contrary, in some places we find only regular epithelium, in others syncytium, and in others, again, both.

Fig. 46.

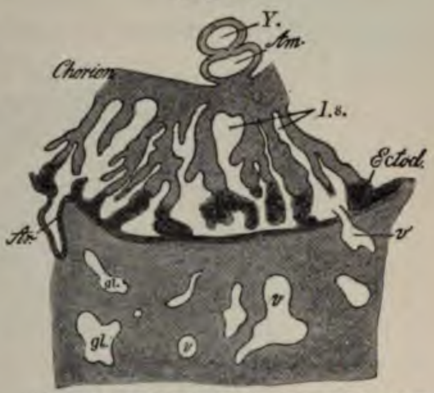


Blood-vessels of a portion of a villus of the chorion. (Liégeois. Tarnier et Chantreuil, Traité de l'Art des Accouchements, Paris, Steinheil.) 1, artery, and, 2, vein, united by arched anastomoses; 3, syncytium; 4, stroma.

At the end of the third or the beginning of the fourth week the villi are furnished with blood-vessels, each villus receiving an arterial branch, which breaks up into a capillary net, from which, again, starts one venous branch (Fig. 46). From the very beginning of the embedding of the ovum in the mucous membrane of the uterus, the villi of the chorion enter into direct connection with the maternal tissue. In monkeys this stage has been directly observed. Cells are produced in large quantity on the tips of the villi and form columns that perforate the epithelium of the uterus and swell up at the ends, developing little buttons in the tissue of the decidua (Fig. 47). Next this epithelium of the decidua melts, forming a layer of fibrin, on which the later formed branches of villi are inserted, without entering the deeper portions of the mucous membrane (Fig. 48).

In the above-mentioned case of Peters the uterine glands are pushed aside by the ovum and do not open into the cavity containing it. But this seems to be accidental, for in another ovum of nearly the same age described by Leopold the glands not only connect with that cavity, but some of them even contain villi. The presence of that thrombus seen at the top of the ovum may, perhaps, indicate some abnormality in the process, but another and more plausible explanation is that the ovum originally was inserted in a tear of the epithelium, such as we have described in speaking of the menstrual decidua. It is not likely that nature would restrict the possibility of the insertion of the ovum within unnecessarily narrow limits. In all probability it does not make any difference whether the ovum settles on an entire or a torn part of the epithelium, whether it strikes the opening of a gland or the interglandular surface. Nature strives to perpetuate all its creations.

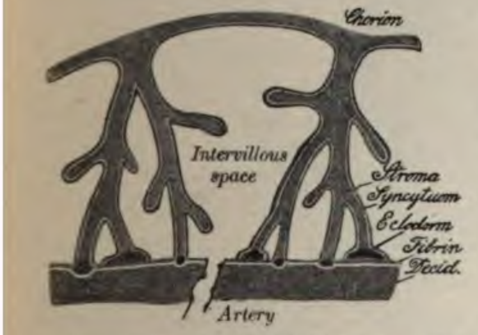
FIG. 47.



First connection between the ovum and the uterus in a monkey. (Selenka.) *Y.*, yolk-sac; *Am.*, amnion; *I.s.*, intervillous spaces, connected with arteries and veins and filled with blood; *Ectod.*, ectodermal proliferations at the ends of the villi of the chorion; *v*, *v*, veins; *gl.*, uterine glands; *Ar.*, artery, and *v'*, vein, opening in intervillous spaces.

The room between the villi, the *intervillous spaces*, communicates with the arteries and veins of the decidua, the endothelium of which vessels also extends over the inside of those spaces, which intercommunicate, but are closed towards the ovum. Some of the villi are, as we have seen, inserted in or on the decidua and serve to hold the ovum in place,—*fixation-villi;* while others bathe in the blood circulating in the intervillous spaces and absorb nutritious matter for the development of the ovum and fœtus,—*nutrition-villi.*

FIG. 48.



First insertion of the villi of the chorion in the decidua. Schematic. (Mertens.) An artery is seen entering the intervillous space from the uterus.

At first the whole ovum is covered with villi connecting with the decidua serotina and decidua reflexa, but their destination differs much: while those of the serotina grow and acquire large proportions, those connecting with the decidua reflexa get less and less nourishment, atrophy, and disappear at the end of the second month of gestation, from which time the chorion offers two areas of very different appearance, the *shaggy chorion*, or *chorion frondosum*, and the *smooth chorion*, or *chorion læve.*

CHAPTER III.

PLACENTA.

The placenta is the organ that forms the communication between the mother and the fœtus. While that part of the chorion that is in contact with the serotina becomes more and more developed and forms new branches stretching out against the maternal tissue, this does not remain inert. Pegs and partition walls grow out from the decidua, enter the spaces between the villi, and grow together with the chorion, forming a framework which affords solidity to the structure

Fig. 49.

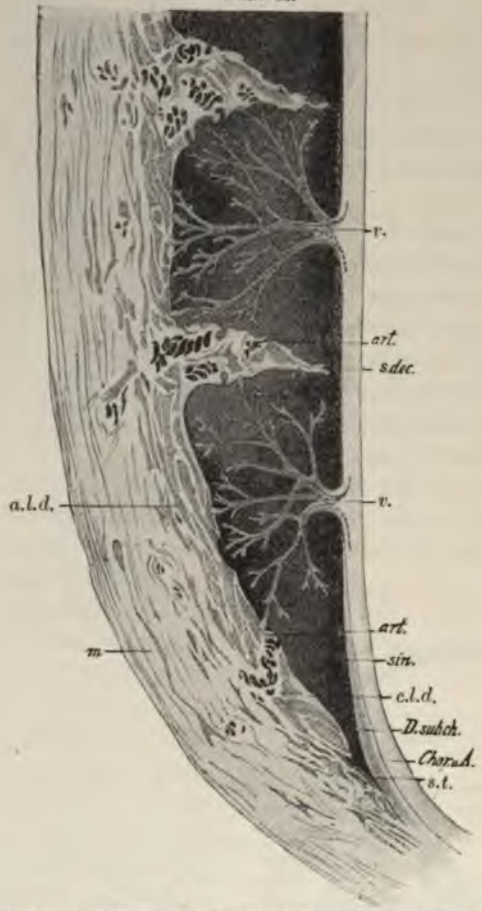
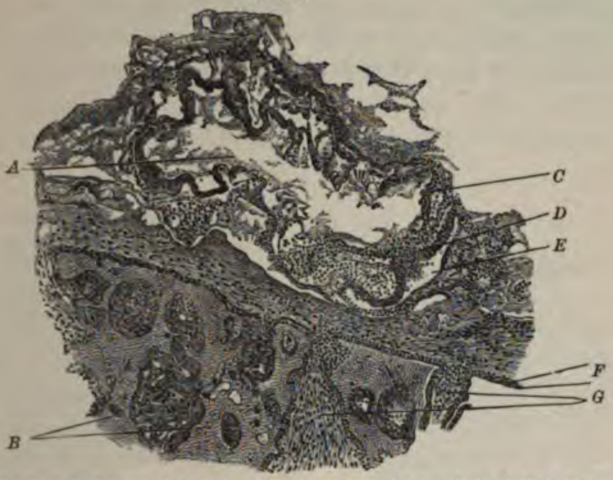


Diagram of vertical section of human placenta. (Bumm.) *m.*, muscular layer of uterus; *a.l.d.*, ampullar layer of decidua; *c.l.d.*, compact layer of decidua; *D. subch.*, decidua subchorialis; *s. dec.*, septa extending from serotina to chorion; *art.*, arteries in the septa opening into the intervillous spaces; *v.*, *v.*, tufts of chorion with fixation-villi and nutrition-villi; *sin.*, sinuses, or intervillous spaces, filled with blood, the dark portions representing venous blood and the light arterial blood; *s.t.*, sinus terminalis.

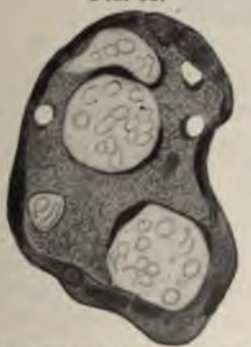
of the placenta. In the neighborhood of the circumference of the placenta the chorion and the serotina become bound together by the formation of what is known as the *decidua placentalis subchorialis*, or the *Schlussplatte* (occluding layer) of Winkler (Fig. 49), a flat, circular layer of tissue which seals the placental cavity. The uterine epithelium is lost all over the serotina, and in the subchorialis the decidua-cells coalesce with the chorion. The intervillous spaces remain in direct communication with the maternal arteries and veins, so that the villi are constantly bathed in maternal blood (Fig. 50). On the other hand, the fetal blood circulates in vessels tunnelling each villus (Fig. 51). Nowhere is there a direct communication between maternal

FIG. 50.



Young human ovum with germinal disk and villi of the chorion bathed in the blood of the intervillous sinuses. (Siegenbeck van Heukelom.) *A*, vitelline cavity; *B*, syncytium; *C*, hypoblast; *D*, mesoblast; *E*, cavity of amnion; *F*, chorion; *G*, connective-tissue stroma of villus.

FIG. 51.



Transverse section of a villus of the chorion at the end of pregnancy. (Eckardt.) Spaces filled with fetal blood lie in the stroma, which is covered with the epithelium of the chorion.

and fetal blood, but the barrier between the two is formed only by the stroma and the epithelium of the villi.

From the third month giant cells appear among the decidua-cells and become more numerous as pregnancy progresses. They wander into the intervillous spaces and gradually fill them, so as to limit the blood-supply more and more,—the *thrombosis of the sinuses*,—thus preparing for the time when the connection between mother and child shall cease.

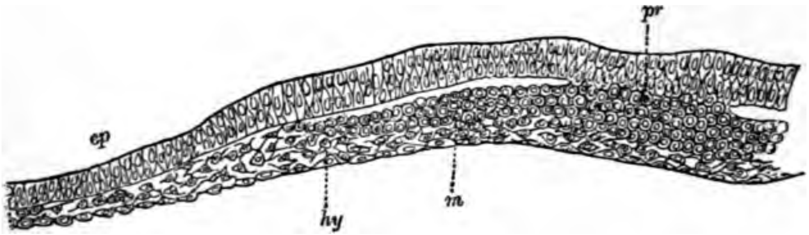
CHAPTER IV.

DEVELOPMENT OF THE OVUM AND THE EMBRYO.

In regard to the details of the development of the embryo and fœtus the reader is referred to works on embryology; but there are features of the ovum which could not be understood unless we comprehended in our description an outline of the earlier stages of fetal development; and as it is also of practical importance for the obstetrician to be able to tell the age of a fœtus expelled by abortion, we shall add the chief stages of development attained at regular intervals of about four weeks.

We left the ovum at the moment when the ectomeres had closed around the entomeres and a fluid had accumulated between the two, except on a small area, where they remained in contact. This part is called the *germinative disk*, or *blastos*, because from it the embryo is formed. The whole ovum is called the *blastodermic vesicle* (corresponding to the *blastoderm* in the chick); the outer layer of cells is named the *ectoderm*, and the inner the *entoderm*. Between these two soon appears a third layer, the *mesoderm*. Within the germinative area these different layers are respectively termed the *epiblast*, the *hypoblast*, and the *mesoblast* (Fig. 52). The inner part of the germinal disk remains transparent and is denominated the *area pellucida*, while the outer becomes darker and is designated the *area opaca*.

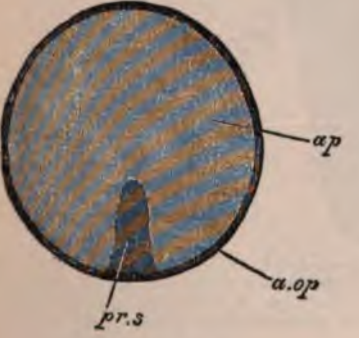
Fig. 52.



Transverse section through the anterior end of the primitive streak and blastoderm of the chick. (Balfour.) *pr*, primitive groove; *m*, mesoblast; *ep*, epiblast; *hy*, hypoblast.

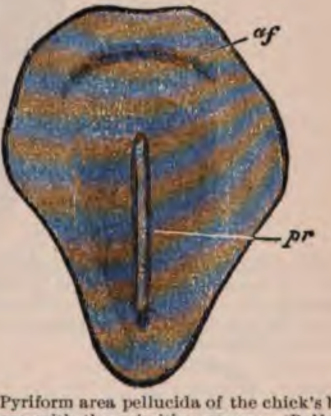
The first sign of the development of the fetal body is the appearance of a thicker, lengthy, and narrow part called the *primitive streak.* The edges growing upward, a central depression is formed, the so-called *primitive groove* (Figs. 53, 54). The primitive streak and groove are evanescent organs and do not form any portion of the embryo, but in front of the primitive groove a similar but larger formation takes place, a groove in the middle, called the *medullary groove*, and two lateral ridges, the *medullary folds*, which grow together in front and enclose the primitive streak behind (Fig. 55). The ridges extend upward and unite, forming the *medullary canal*, the beginning of the nervous system.

FIG. 53.



Transparent area of the blastoderm of a chick at a very early period, showing the commencement of the primitive streak. (Balfour.) *pr.s*, primitive streak; *ap*, area pellucida; *a.op*, area opaca.

FIG. 54.

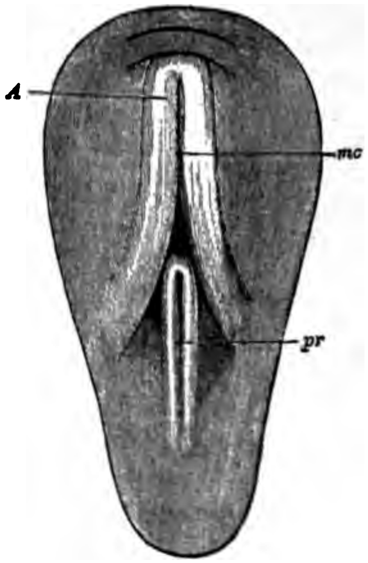


.Pyriform area pellucida of the chick's blastoderm, with the primitive groove. (Balfour.) *pr*, primitive streak and groove; *af*, amniotic fold commencing; the darker shading around the primitive streak indicates the extension of the mesoblast.

The nervous system, as well as the epidermis, is formed by the epiblast. The hypoblast forms the glandular part of the intestine. The mesoblast separates into an inner column, that is the foundation of the craniovertebral skeleton and the associated voluntary muscles, and an outer portion, which, again, splits into an upper and a lower layer, the *parietal* or *somatic* plate and the *visceral* or *splanchnic* plate, also respectively called the *somatopleure* and the *splanchnopleure* (Fig. 56). Of these the upper together with the epiblast gives origin to the amnion, a membrane surrounding the embryo, and the lower together with the hypoblast forms two other membranes, which are in direct continuity with the wall of the alimentary canal,—viz., the yolk-sac and the allantois (Fig. 57).

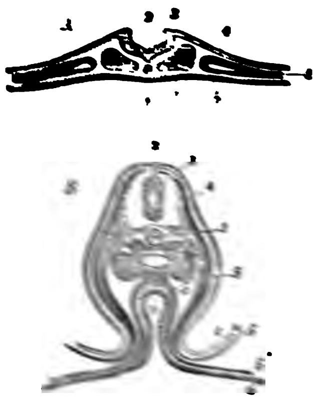
The embryo, which at first is represented by a flat disk on a small part of the blastodermic vesicle, closes gradually from side to side (Fig. 56) and becomes curved by the approach of the cephalic extremity and the caudal end towards each other (Fig. 57).

FIG. 55.



Surface view of the transparent area of the blastoderm of a chick eighteen hours old. (Balfour.) pr, primitive groove, closed in front by the coalescence of the two lateral ridges; mc, medullary groove, having on each side a medullary fold or ridge, A, which also meet in front so as to close the groove, but diverge behind, enclosing the primitive streak; in front the fold of the amnion is commencing.

FIG. 56.

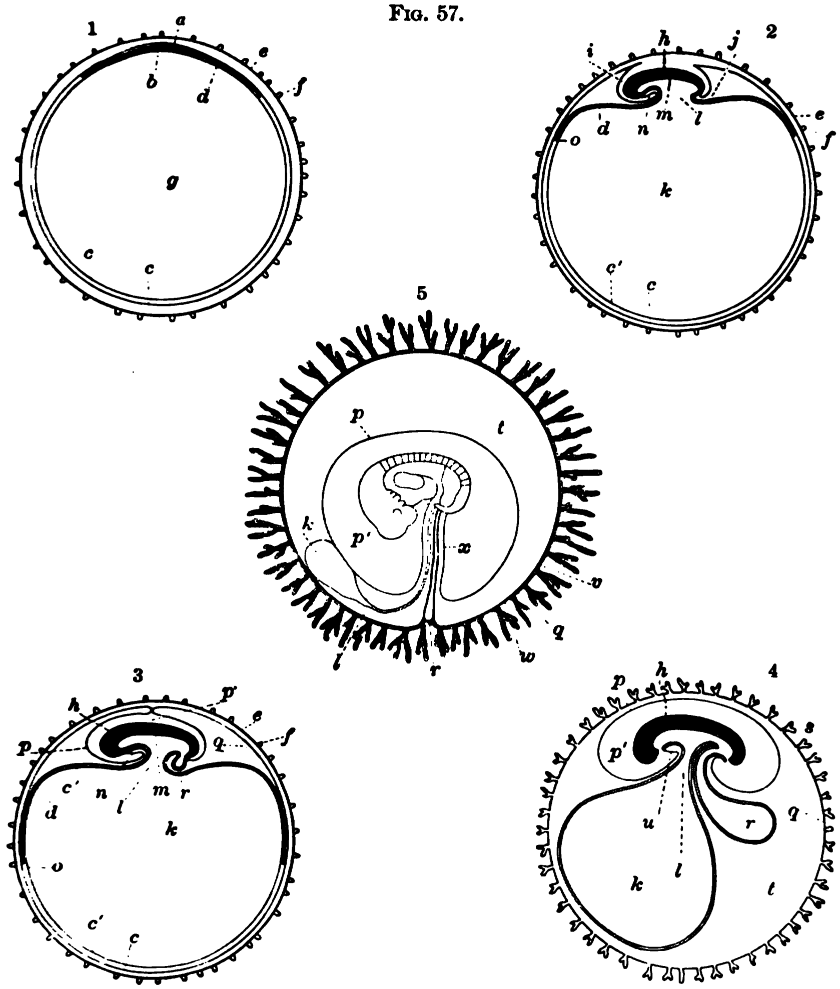


Transverse section through [illegible] and some time after the closure of the medullary [illegible] the mesoderm. (Remak.)

A, [illegible] spinal column; 2, medullary [illegible] the brain and spinal marrow; [illegible] 7, section of [illegible] cavity.

B, [illegible] 2, medullary canal closed; 3, [illegible] after it [illegible] 4, muscular [illegible] the intestine and spreading [illegible] the amnion; 7, [illegible] visceral [illegible]

FIG. 57.



Five schematic figures, showing the development of the fetal membranes. The fœtus is represented in longitudinal section. (Kölliker.)

1. Ovum in which the chorion has begun to be formed, with blastodermic vesicle, germinative disk, and the substratum of the embryo. *a*, thickening of epiblast, part of embryonal rudiment; *b*, thickening of mesoblast, going to form part of embryo; *c*, blastodermic vesicle, outer layer; *c'*, blastodermic vesicle, inner layer; *d*, extension of mesoblast between the two layers of the blastodermic vesicle; *e*, vitelline membrane, or primitive chorion; *f*, commencing villi of chorion; *g*, cavity of the blastodermic vesicle, becoming later the cavity of the yolk-sac.

2. Ovum with beginning formation of amnion and yolk-sac. *h*, embryo; *i*, cephalic fold of amnion; *j*, caudal fold of amnion; *k*, cavity of yolk-sac; *l*, vitelline duct; *m*, hypoblast; *n*, wall of the thorax in the region of the heart; *o*, sinus terminalis, circumference of the vascular area in the early stages. Other letters as in 1.

3. Ovum with closing amnion and sprouting allantois. *p*, amnion; *p'*, cavity of amnion; *q*, false amnion; *r*, allantois. Other letters as in 1 and 2.

4. Ovum in which the amnion is closed, the true amnion surrounding the embryo, the false amnion combining with the chorion. *s*, villi of the chorion more advanced; *t*, space between amnion and chorion, containing an albuminous fluid; *u*, pericardial cavity. Other letters as in 2 and 3.

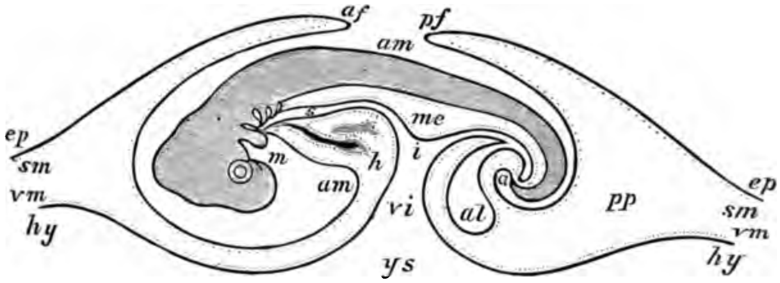
5. Ovum in which the vascular layer of the allantois has spread over the false amnion, and its vessels have grown into the villi of the chorion, constituting the true chorion; the yolk-sac is atrophied and the cavity of the amnion is increasing in size. *v*, true chorion; *w*, villi of the true chorion more advanced; *x*, sheath of navel-string formed by amnion. Other letters as in preceding figures.

CHAPTER V.

AMNION.

At a very early stage, as soon as the primitive streak has appeared (Fig. 54), a fold is raised from the epiblast and mesoblast at the cephalic end of the embryo; a similar fold is thereafter formed at the caudal end; these are called the *cephalic* and *caudal folds of the amnion.* Gradually this process extends around the whole embryo, and the fold rises more and more (Fig. 58) until finally it closes over the back of the embryo and separates into its two layers, the true and the false amnion. The *true amnion* forms at first an involucrum in contact with the embryo, but by and by a fluid, *liquor amnii*, collects between it and the embryo. The *false amnion* applies itself to the inside of the chorion, with which it blends.

Fig. 58.



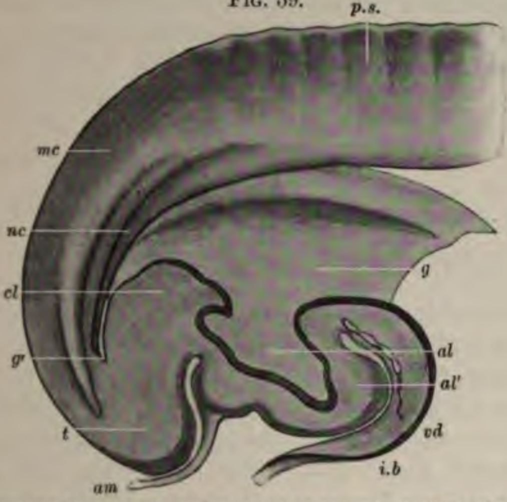
Enlarged diagrammatic outline of a longitudinal vertical section of the chick and neighboring parts of the blastoderm on the fourth day. (Allen Thomson.) *ep*, epiblast; *sm*, parietal mesoblast; *hy*, hypoblast; *vm*, visceral mesoblast; *af*, cephalic fold; *pf*, caudal fold of amnion; *am*, cavity of the true amnion; *ys*, yolk-sac; *vi*, vitello-intestinal aperture, or vitelline duct; *i*, intestine; *s*, stomach and gullet; *a*, the future anus, still closed; *m*, the mouth, still closed; *me*, mesentery; *al*, allantois; *pp*, space between the outer and inner layers of the amnion. The epiblast and hypoblast are drawn with entire lines, the parietal mesoblast with an interrupted line, and the visceral mesoblast with a dotted line.

CHAPTER VI.

THE ALLANTOIS.

Our knowledge of the allantois is based on observations upon animals. In them it is a vesicle growing out from the posterior part of the intestine (Figs. 57, 58, and 59), with which its cavity communicates. It plays an important part in the nutrition of the ovum and the fœtus by carrying blood-vessels to the villi of the chorion, some of which participate in the formation of the placenta; but it soon ceases to be a hollow bag, and in the human ovum its cavity perhaps never extends beyond the umbilicus. That part of it which is situated inside of the embryo remains hollow and becomes the urachus and the bladder.

FIG. 59.



Longitudinal section through the posterior end of an embryo chick of two days and sixteen hours. Beginning formation of the allantois. Enlargement thirty-five. (Kölliker.) *g*, posterior entrance to gut; *g′*, end of hind-gut; *al*, cavity of allantois; *al′*, protuberance of allantois; *vd*, wall of the later vitelline duct; *i.b*, transition of the intestinal wall into the deeper parts of the blastoderm, which later form the yolk-sac; *am*, origin of amnion from the posterior end of the substratum of the allantois; *t*, tail; at the bottom of the fold between the amnion and the tail opens later the anus; *cl*, protuberance of the cloaca; *nc*, notochord; *mc*, medullary canal; *ps*, protovertebral somites.

CHAPTER VII.

THE YOLK-SAC, OR UMBILICAL VESICLE.

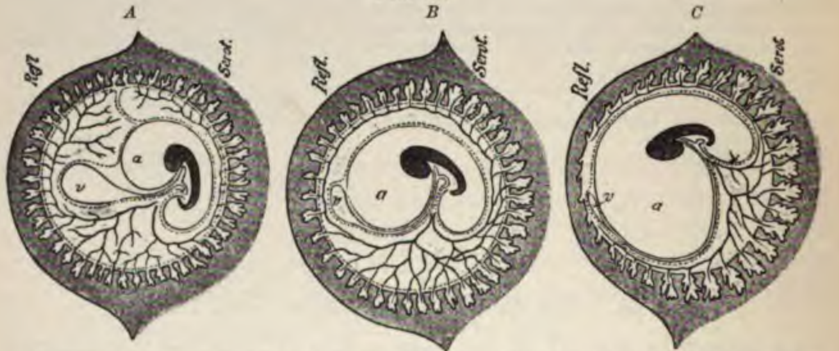
A GLANCE at Fig. 57 shows that, while at first the blastodermic vesicle contains a cavity which on section has the shape of a circle, this is soon changed to a figure-of-eight. The upper, smaller portion of the cavity is embedded in the body of the embryo, where it eventually becomes the lumen of the intestine, while the larger remains in the ovum proper, and is called the *yolk-sac*. This partition of the cavity is caused by the above-mentioned curvature of the embryo, in consequence of which the communication between the two, *the vitelline duct*, or *omphalo-enteric duct*, becomes narrower and narrower, until it finally is closed by the formation of the umbilicus. Thence it extends in the shape of a filament through the umbilical cord, and leads to a little vesicle found near the periphery of the placenta, even at the end of pregnancy. The yolk-sac consists, like the intestine, of two layers, an inner epithelial layer, formed of the inner layer of the blastodermic vesicle, and an outer layer, derived from the visceral layer of the mesoblast (Figs. 57, 58). Physiologically it is a store-room, containing food enough for the fœtus until the placenta is sufficiently developed to bring a constantly changing supply.

CHAPTER VIII.

FORMATION OF THE UMBILICAL CORD.

THE remnants of the vitelline duct and the yolk-sac, two umbilical arteries and one umbilical vein leading to and from the placenta, and a gelatinous mass called *the gelatin* of Wharton, all covered with a sheath furnished by the amnion (Fig. 57, 5), form a cord, called the umbilical cord, or navel-string, which allows the embryo to move freely in the liquor amnii and is the connecting link between the mother and the child. The string-like shape of the organ is brought about gradually by the accumulation of liquor amnii and the consequent extension of the amnion, until it closes in on the two other sacs, the allantois and the yolk-sac. In the beginning there is only a short, thick stalk, called the *yolk-stalk*, or *abdominal stalk*, by which the fœtus is connected with the chorion (see Figs. 65, 67, 68, 69, 70), and into which the allantois grows.

FIG. 60.



Schematic representation of the formation of the umbilical cord and its central insertion. (Ahlfeld.) *Refl.*, decidua reflexa; *Serot.*, decidua serotina; *a*, cephalic fold of amnion; *v*, umbilical vesicle; *A*, the back of the embryo turned towards the serotina; *B*, embryo partly turned; *C*, the turning being accomplished, the ventral surface of the embryo is nearest to the serotina.

Probably the germinative disk, by a provision of nature, as a rule, develops on the part of the ovum opposite to the decidua serotina, so that its ventral aspect is turned towards the placenta, as represented in Fig. 57, 5, just as the blastoderm of a chick always turns to the top of the egg, where it is most favorably exposed to the maturing influence of the heat given off by the hatching hen. If such a disposition does not exist in man, the embryo must turn inside of the ovum, as represented in Fig. 60, *A*, *B*, *C*, a turning which is brought about by a preponderance in growth of the cephalic fold of the amnion and pressure on the corresponding part of the allantois, by which this is made to atrophy.

The blood-vessels of the serotina being more developed than those of the reflexa, nourishment is more plentiful here, and the result is a central insertion of the navel-string on the placenta. That such a process really takes place, at least occasionally, is proved by the aberrations from the normal course, resulting in an excentric insertion on the placenta or even an insertion on the membranes.

Between the chorion, the amnion, the allantois, and the yolk-sac is found an albuminous fluid, which gradually becomes inspissated and on preserved specimens looks like a membrane. This substance is known as the *tunica media*, or *membrana intermedia*, of Bischoff, or the *magma réticulé* of Velpeau.

CHAPTER IX.

NUTRITION.

THE ovum contains in its vitellus nourishing substances, but these would soon be exhausted if they were not renewed. At first the ovum and the embryo receive the material needed for their development by mere endosmosis from the maternal tissues with which the ovum is in contact; and in this connection it may be well to remember the fine villi that sprout out on the surface of the zona pellucida while the ovum is still on its way from the ovary to the uterus. These increase materially the surface area of the ovum, and are particularly fit to absorb fluid, like the rootlets of a germinating plant.

At a later stage of development, when the true chorion is formed and its villi with their blood-vessels grow into the decidua reflexa and serotina, nourishment is derived through them from the maternal blood. Still later, after the formation of the placenta and the disappearance of the villi corresponding to the reflexa, the whole nutrition takes place through the placenta.

As we have seen above, there is nowhere a direct communication between the blood of the mother and that of the fœtus. The villi of the chorion bathe in the blood of the intervillous spaces, but they are covered all over with a single or in most places even with a double layer of epithelium, and the fetal arteries communicate only with fetal veins. But if under ordinary circumstances there is no direct communication, a lively interchange of substances takes place between mother and child by osmosis through the walls of the villi of the chorion and of the blood-vessels in their interior.

In this way gaseous and fluid substances are transferred. Ether given to the parturient mother may be recognized by the smell imparted to the breath of the new-born babe. Chloroform and oxide of carbon have been shown to pass from the mother to the fœtus.

The blood in the umbilical vein is of a bright-red color and that in the umbilical arteries is dark, the difference evidently being attributable to the presence of a large amount of oxygen in the former and of carbonic acid in the latter. This conclusion has been corroborated by quantitative chemical examination of the blood circulating in the different vessels.

Different drugs, such as iodide of potassium, salicylic acid, and ferrocyanide of potassium, administered to the mother, have been found in the fœtus. Thus medicinal substances taken by the mother may affect her unborn child. This is notably the case with opium, mercury, copper, lead, arsenic, and the iodides.

While thus we are warranted in stating in a general way that all gaseous substances and those soluble in water can pass the barrier between the maternal and fetal organisms, the statement does not apply to solid bodies, even of very small dimensions. On the contrary, there is ample reason to believe that no solid body, be it ever so little, can pass through the normal placenta. To this effect numerous experiments have been made with substances that, on account of their color, are easily recognizable, such as cinnabar, madder, and India ink. These experiments have so often given a negative result that the conclusion seems warranted that in the exceptional cases in which a transfer took place it was due to a minute injury of the epithelium of the villi of the chorion. Not even the physiological emulsion of fat absorbed by the villi of the intestine can pass those of the chorion. In a case of leucocythæmia the fetal blood remained unchanged, showing that the white blood-corpuscles did not pass from mother to child, while the red blood-corpuscles are normally much more numerous in fetal than in maternal blood, which proves that they do not pass from one to the other.

New interest has been added to the question about the possibility of the passage of solids from the mother to the child since we know that in certain catching diseases the infection is caused by micro-organisms. Thus, the microbes of typhoid fever, pneumonia, tuberculosis, and vaccinia, as well as staphylococci, streptococci, and bacillus coli communis, have been found in the fœtus, where they could come only from the mother. But since these cases are comparatively rare and we here deal with pathological conditions, the above reasoning not only holds good, but its correctness is even corroborated,—namely, that the migration of these microbes from the maternal to the fetal placenta occurs only when there is an abnormal solution of continuity in the latter.

Another source of nutritive elements is the liquor amnii, an albuminous fluid, of which the fœtus swallows large quantities, as proved by the presence of an abundance of a black or dark-green, tarry mass, called *meconium*, in the lower part of the intestine of the new-born child, containing hairs and epidermis-cells which have been detached from its skin. The amount of this substance is so large that it probably serves to determine the formation of the cavity of the pelvis; and if we compare the different degrees of density between the watery liquor amnii and the tarry meconium we can imagine that large amounts of the former have been needed to form the latter, even if we take into consideration the fact that bile and intestinal epithelium form part of it.

CHAPTER X.

SECRETION AND EXCRETION.

We have already mentioned that the carbonic acid of the blood passes from the fetal to the maternal vessels. The same is in all likelihood the case with effete matter of the fetal body. That such a transfer takes place from the fœtus to the mother has been proved experimentally by injecting strychnine into the fœtus of an animal and thereby poisoning the mother.

Bile is secreted by the liver and forms part of the meconium. In the stomach are found pepsin and rennet.

In regard to the function of the kidneys opinions differ. Formerly the liquor amnii was believed to be the fetal urine excreted by the urinary organs, but this theory has met with much adverse observation and argument. The criticism that it would seem strange if the fœtus should be suspended nine months in its own urine and drink it and give it off again is not so forcible as it may appear at the first glance, because, as we shall presently see, a somewhat similar arrangement actually exists in regard to the fetal blood. But the amount of urea found in the liquor amnii at term is very small (0.03–0.04 per cent.), and in cases of early premature birth there is none at all. The pressure in the fetal arteries is so small compared with that exercised by the uterus on the ovum that not much urine could be secreted by the kidneys and made to fill the bladder. Most of the instances that have been alleged as proof of accumulation of large amounts of urine in the bladder were cases of atresia ani vesicalis, in which the fluid may have come from the intestine and the liquor amnii and not from the kidneys. In a case of premature rupture of the membranes, with living fœtus, the liquor amnii was repeatedly examined during thirty-one days, and contained only traces of urea. It seems, therefore, to be proved that the liquor amnii is not fetal urine; but that occasionally, especially towards the end of pregnancy, some urine mixes with it. It originates chiefly in the mother and reaches the fœtus by exudation.

CHAPTER XI.

RESPIRATION.

During fetal life the placenta is the exclusive organ of respiration. In the villi of the chorion and the intervillous spaces filled with maternal blood the interchange of substances between the fœtus and the mother takes place, the former giving off carbonic acid and absorbing oxygen.

CHAPTER XII.

CIRCULATION.

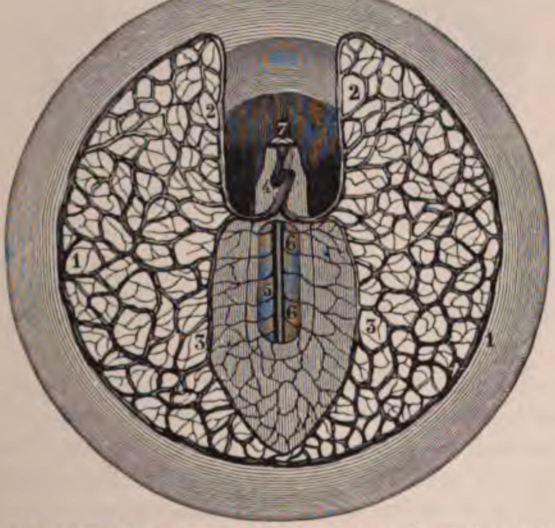
During fetal development and shortly after the birth of the child three different systems of circulation are in use, and, as might be expected, the transition from one to the other is not abrupt, but one gradually replaces the other.

The human heart develops early. It is discernible and shows rhythmic contractions a few hours after the formation of the primitive streak, but does not at that early period communicate with the blood-vessels, so that there is no circulation until later, when the blood-vessels, formed independently, connect with the heart.

The *first embryonic circulation* takes place in the yolk-sac. The blood goes from the two primitive aortæ, or inferior vertebral arteries, through the omphalomesenteric arteries to the upper part of the umbilical vesicle,—that is, that portion of it which is nearest the embryo,—and returns through the sinus terminalis and the omphalomesenteric veins to the sinus of the heart (Figs. 61, 62). Later the two inferior vertebral arteries blend, forming the abdominal aorta. The omphalomesenteric arteries, which in the beginning are numerous, atrophy and are reduced to two, and finally to one, the right omphalomesenteric artery.

The first circulation takes place in the following way. The heart contracts (systole), propelling the blood into the aorta, whence it enters the vertebral arteries, and from them goes to the omphalomesenteric arteries, which distribute it over the vascular area of the umbilical vesicle in capillary vessels. The blood takes up nutritive elements from the vitellus, and returns through the sinus terminalis, the omphalomesenteric veins, the sinus of the heart, and the heart itself, which it finds relaxed (diastole). This system of circulation exists only a short time. At the end of the fifth week it has already begun to give way to the second circulation, that of the placenta.

FIG. 61.

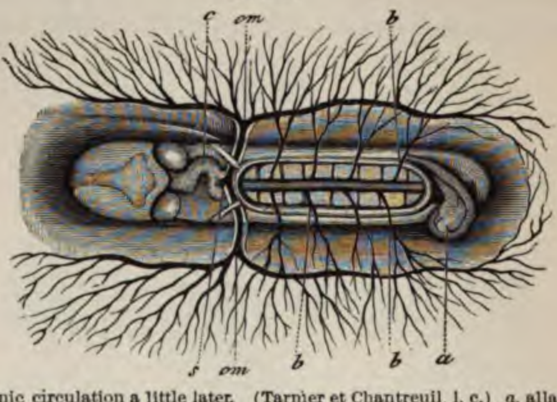


The first embryonic circulation in the vascular area of the yolk-sac of a rabbit. (Bischoff.) 1, sinus terminalis; 2, omphalomesenteric vein; 3, lower branch of the same; 4, heart, bent like an *s*; 5, primitive aortæ, or inferior vertebral arteries; 6, omphalomesenteric arteries; 7, primary optic vesicles.

The *second embryonic circulation* is brought about by means of the allantois, that other sac which protrudes from the abdominal surface of the fœtus. This carries blood-vessels to all the villi of the chorion, but, as we have seen above, those implanted in the decidua reflexa soon become atrophied and disappear, while those entering the decidua serotina flourish and acquire such dimensions that they make up the bulk of the placenta at term.

At the time this second circulation is established the heart has become divided into auricles and ventricles, but between the two auricles there is an opening, the *foramen of Botallo*, or *foramen ovale*. The pulmonary arteries have been formed, but they communicate with the aorta through the *ductus arteriosus of Botallo*. Finally, the liver and the vena porta have been formed. The vena porta is that part of the omphalomesenteric vein which comes from the intestine and opens into the right advehent hepatic vein. The other portion which is distributed over the yolk-sac becomes smaller and smaller and disappears. The umbilical vein anastomoses with the venæ hepaticæ advehentes, and from this point a large canal, the *ductus venosus of Aranzi*, leads to the vena cava inferior (Figs. 63, 64).

FIG. 62



First embryonic circulation a little later. (Tarnier et Chantreuil, l. c.) *a*, allantois, just budding; *b*, *b*, *b*, omphalomesenteric arteries, coming from the two primitive abdominal aortæ, or inferior vertebral arteries; *om*, *om*, the two trunks of the omphalomesenteric veins; *s*, sinus of heart; *c*, heart.

In the second, or placental, circulation the blood moves in the following way. From the left ventricle it goes through the ascending aorta and the arch of the aorta, and simultaneously from the right ventricle through the pulmonary artery. The blood from the aorta goes to the innominate artery, the left carotid, and the left subclavian artery, supplying the head and the upper extremities. Of that coming through the pulmonary artery only a little enters the still small branches of that artery ramifying in the two lungs: by far the greater portion goes through the duct of Botallo, the descending aorta, and the common iliac arteries. Where these bifurcate, the smaller portion passes through the external iliac artery to the lower extremity, and the much larger flows through the internal iliac artery and its continuation, the umbilical artery, to the placenta, where oxygenation takes place by contact with the maternal blood. As we have seen above, not a drop of blood passes from the mother to the fœtus, but the oxygen in the maternal blood is transmitted through the fine membrane separating the blood circulating in the villi of the chorion from that circulating in the intervillous blood-spaces of the maternal

Fig. 63.—Second fetal, or placental circulation. 1, fetal surface of placenta, on one-half of which the amnion has been removed, showing the branches of the umbilical vein (red) and the umbilical arteries (purple); 2, chorion; 3, amnion; 4, umbilical cord; 5, umbilicus, where the vessels of the cord separate; 6, umbilical vein; 7, advehent hepatic vein; 8, trunk of vena porta; 9, venous duct of Aranzi; 10, anastomosis between the venous duct and the vena cava inferior; 11, vena cava inferior above the diaphragm; 12, right auricle of heart; 13, ventricles of heart; 14, vena cava superior; 15, ascending aorta; 16, pulmonary artery; 17, right and left pulmonary branches of the same; 18, arterial duct of Botallo; 19, descending aorta; 20, abdominal aorta (cut); 21, common iliac artery; 22, external iliac artery; 23, umbilical artery, continuation of the internal iliac artery.

Fig. 64.—Fetal heart and chief blood-vessels. 1, vena cava inferior; 2, Eustachian valve; 3, foramen of Botallo; 4, vena cava superior; 5, ventricles; 6, pulmonary artery; 7, arterial duct; 8, aorta.

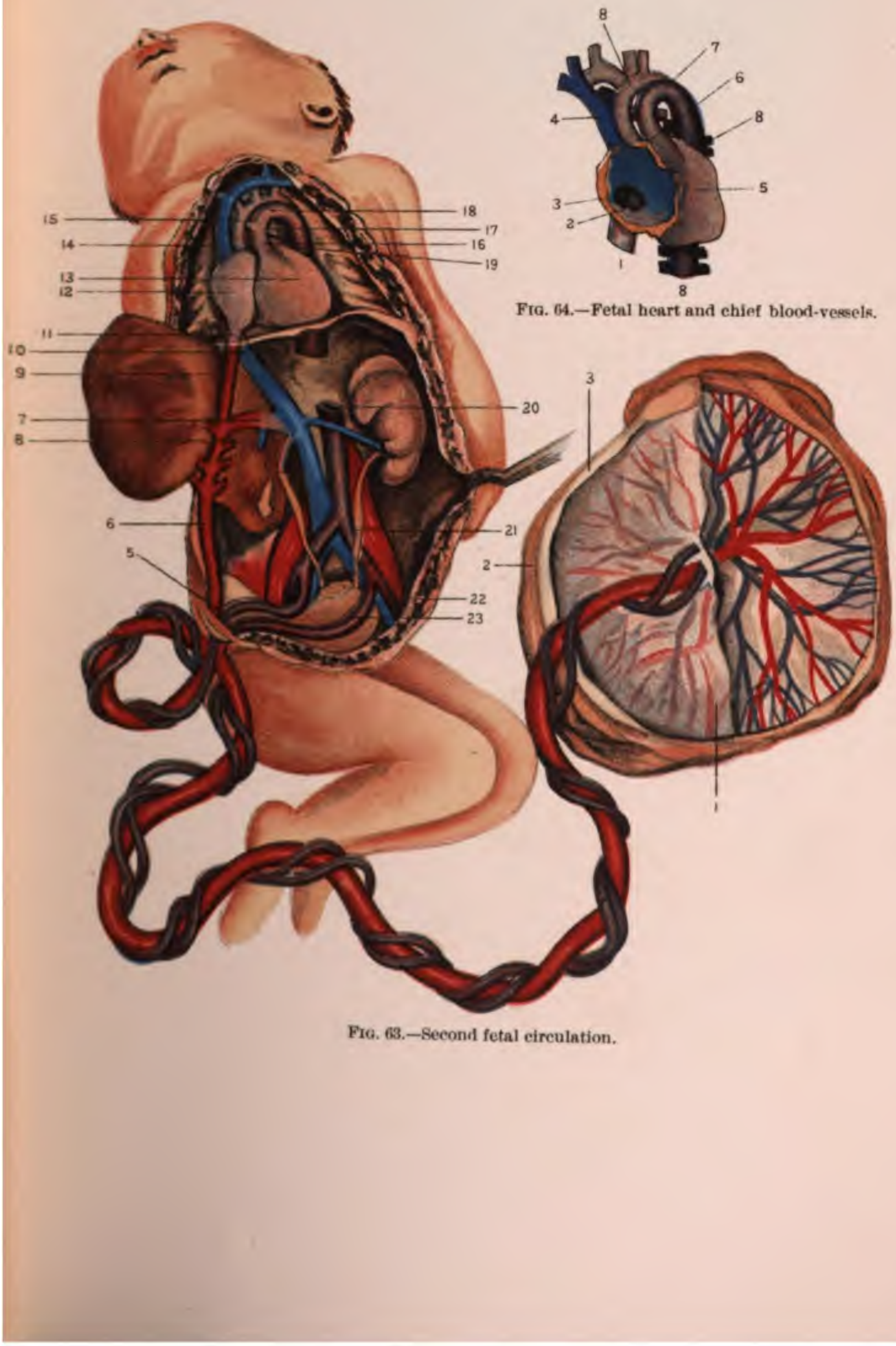


FIG. 64.—Fetal heart and chief blood-vessels.

FIG. 63.—Second fetal circulation.

portion of the placenta, and combines with the red blood-corpuscles of the fœtus, changing the hue of the blood from a dark cherry color to a bright scarlet.

From the capillaries of the placenta the rejuvenated blood flows through the umbilical vein to the umbilicus, where it divides into three currents, two of which go to the right and left through the venæ hepaticæ advehentes to the substance of the liver, while the median current continues in a straight course through the ductus venosus, lying on the lower surface of the liver, and enters the vena cava inferior, which leads it to the right atrium. Here, again, a separation takes place, one portion going to the right ventricle and another through the foramen of Botallo to the left atrium and thence to the left ventricle, thus returning to the starting-point.

The characteristic of the placental circulation is that the two kinds of blood, the arterial and the venous, are not separated. The pure blood of the umbilical vein and the ductus venosus mixes with impure blood coming through the revehent hepatic veins from the liver and through the omphalomesenteric vein, that gradually is transformed to the portal vein, also from the intestine. At the liver there is namely a double set of veins: the *venæ hepaticæ advehentes* bring pure blood to the liver; the *venæ hepaticæ revehentes* carry impure blood away from that organ. The former start from the umbilical vein at the lower end of the venous duct, while the latter enter this duct at its upper end. Thus, inside the body of the fœtus there is unmixed arterial blood only on the short distance from the umbilicus to the anastomosis between the venæ hepaticæ revehentes and the upper end of the ductus venosus.

As the current progresses, the blood becomes more and more mixed. In the vena cava inferior it comes together with that returning from the lower extremities and the pelvic organs. In the right auricle it receives the blood coming from the head and the upper extremities, and in the left auricle it is joined by the blood from the lungs. The most impure blood is that flowing through the veins of the trunk and the lower extremities.

The head and the upper extremities receive somewhat better blood than the trunk and the lower extremities, for, on account of the anatomical disposition and the direction of the current of the blood, most of that coming through the vena cava inferior, and which is less impure, flows through the foramen ovale, the left auricle, the left ventricle, and the aorta to the head and the upper extremities, while the trunk and the lower extremities are fed with the purely venous blood from the vena cava superior and a small quantity of blood from the vena cava inferior, which blood goes from the right ventricle through the pulmonary artery and the ductus arteriosus, enter-

LANE LIBRARY

ing the aortal blood after the head and the upper extremities have been supplied.

Third Circulation.—After the first breath the final circulation, that which continues through life, has its beginning. The seat of oxygenation is now moved from the placenta, from which the child will soon be separated, to the lungs. It is characterized by being double, one portion of the blood circulating between the heart and the lungs and another between the heart and the periphery of the body, and by the strict separation between arterial and venous blood. The foramen ovale closes. The ductus arteriosus loses its lumen and forms a short fibrous cord between the pulmonary artery and the arch of the aorta. That portion of the umbilical arteries that lies between the trunk of the hypogastric artery and the umbilicus is transformed into the true lateral ligaments of the bladder. The umbilical vein becomes the round ligament of the liver, and the ductus venosus is also obliterated.

From the left ventricle the blood goes through the aorta and its branches to the whole body, ending in capillary nets, from which the blood enters the veins and is poured into the right auricle through the venæ cavæ superior and inferior. Hence it is propelled to the right ventricle, thus completing the *greater* or *systemic circulation.* Next the dark venous blood flows through the pulmonary artery to the lungs, where it is oxidized by absorbing the oxygen of the air which enters through the bronchi, bronchioles, and alveoli. Finally, the blood returns as bright arterial blood through the pulmonary veins to the left auricle and the corresponding ventricle, from which we started. In this way the *lesser* or *pulmonary circulation* is finished.

While the transition from the first to the second circulation takes place very gradually, that from the second to the third is in many respects instantaneous. At the first breath drawn by the child the lungs are filled with air and expanded, so as to attract a large amount of blood. The blood returning from the lung to the left auricle, the pressure between the two auricles is equalized, the current from the right auricle is stopped, and gradually the opening between the two is permanently obliterated.

The umbilical arteries contract and their walls grow thicker until their lumina disappear. The passage is usually completely interrupted at the end of the fourth day. The ductus arteriosus closes by cell proliferation in its wall, and by the end of three weeks it is completely impervious. The umbilical vein and the ductus venosus collapse and are generally closed at the end of a week.

CHAPTER XIII.

OTHER FUNCTIONS.

BESIDES circulation, respiration, nutrition, secretion, and excretion, some other functions are known to take place in the fetal organization. The inspissated condition of the meconium shows that a resorption takes place through the mucous membrane of the intestine. The fact that the meconium is always found in the lowest part of the intestine is proof that this canal is the seat of peristaltic movement. By applying our ear to the abdomen of a woman during the second half of pregnancy we can hear the fœtus move, and on palpating the abdomen during advanced pregnancy we can both feel and see the fœtus move, and the pregnant woman herself feels fetal movements.

CHAPTER XIV.

DURATION OF PREGNANCY.

BOTH for scientific satisfaction and for the just settlement of judicial cases, it would be desirable to know the duration of gestation in woman, but, unfortunately, this is only possible within widely differing limits. In most instances the date of the fecundating coition is unknown, and even in the comparatively small number of observations of cases in which only one sexual approach has occurred, we do not, as explained above, know when fecundation—that is, the combination of the spermatozoid with the ovum—was accomplished. In other words, the true starting-point of gestation is unknown. Furthermore, there cannot be any doubt that the time from the moment of fecundation till the birth of the child varies very much in women, as it does in animals. The same woman finds frequently considerable differences in the duration of her pregnancies. Thus, in a case about which the writer has notes, in six pregnancies the time counted from the first day of the last menstruation was respectively two hundred and seventy-eight, two hundred and ninety-six, two hundred and eighty-two, two hundred and seventy-two, two hundred and sixty-four, and two hundred and seventy-six days, and all the children were born fully developed. In domestic animals, where impregnation is possible only during rut and where in most cases only one coition is allowed, the length of gestation varies very much: in the horse between two hundred and eighty-seven and four hundred and seventeen days, in the cow between two hundred and forty and three hundred and twenty-one days, in the sheep between one hundred and forty-six and one hundred and fifty-eight days, in the sow between one hundred and nine and one hundred and thirty-three days, and in the rabbit between twenty-seven and thirty-five days.

Based on large statistics the supposition is warranted that in woman the time varies between two hundred and twenty and three hundred and twenty days, counting from the fecundating intercourse.

While extremes occur, the average time from the first day of the last menstruation till the birth of the child may be placed at two hundred and eighty days. In animals the duration of gestation is proportionate with their size, the average being for the elephant six hundred and twenty-five, the horse three hundred and forty-five, the cow two hundred and eighty-two, the sheep one hundred and fifty-one, the sow one hundred and fifteen, the dog sixty, the cat fifty-six, and the rabbit thirty-one. Counting from the prolific coition it would, of course, be shorter in women than two hundred and eighty days, and counting from the first missing menstruation, which, as we have seen, probably would be more correct, it would be still shorter. In taking the first day of the last menstruation as starting-point, it must be borne in mind that women not unfrequently menstruate once or twice after having become impregnated, but then the amount of blood lost is always very much smaller than in the unimpregnated condition. Generally the practised hand of the obstetrician will also allow him by means of the size of the uterus to refer the beginning of the gestation to the right menstruation.

For practical purposes, it is necessary to have some easy method of foretelling the expected day of confinement. Subtracting 280 days, the average duration of pregnancy, from 365 days, corresponding to a calendar year, leaves 85 days, which should be subtracted from a year, counting from the first day of the last menstruation, in order to find the day of expected confinement; but as this would be a troublesome calculation, it is made much simpler by *counting three months back, which would be about 92 days, and adding 7 days; e.g.*, if the first day of the last menstruation was the 15th of June, the expected day of confinement is the 22d of March. But the physician should take care to explain to the patient that she may be taken ill either earlier or later. Since the whole calculation is so very inexact, it is not worth while to make a difference for months with thirty or thirty-one days nor special allowance for February with twenty-eight days or bissextile years with three hundred and sixty-six days.

The determination of the shortest and longest possible duration of gestation is of great judicial importance, and, unfortunately, legislation has not followed the accumulated experience of medical science in this respect. The question about the longest possible term presents itself in cases of the birth of a child after a husband's death or absence from his wife. In France and Germany the law declares a child illegitimate if it is born more than three hundred days after the last possible connection between the spouses. In Austria three hundred and seven days are allowed. In England and America a more liberal spirit prevails. A high authority on evidence (Wharton) says: "Physicians must determine the matter, and if the space between the minimum and maximum periods hitherto allowed is shown to be too long or too short, the courts will readily follow the truth as it is made manifest." In America a period of three hundred and thirteen and three hundred and seventeen days respectively has been judicially declared possible. As we have seen above, science admits even the possibility of a much longer term of gestation. Winckel, who has made a special study of the question as expert for the court, places the limit at 320 days, and another German scholar, Schichting, admits even three hundred and thirty-four days.

In cases of protracted gestation the calculation of the woman should, however, be confirmed by the unusual size, weight, and development of the child.

In other cases the medical expert is questioned in regard to an unusually short period of gestation. For instance, a man has been separated for two years from his wife, then they reunite, and at the end of seven months the woman gives birth to a child. The question is, "Can it be his?" The woman's reputation and the child's legitimacy are at stake. A curious case of this kind happened once in high society. The daughter of the house became impregnated by a married artist, and by the advice of her mother she allured an unmarried gentleman to have intercourse with her, accused him of having ruined her, and demanded that he marry her.

In all such cases the medical expert should first carefully look for all signs of maturity or deficient development; but, even if the child is fully developed, he should bear in mind that, just as among animals, there is great latitude in regard to the time needed for full development. We see the same in childhood; one person of fifteen years will look as if he were twenty years old, and another as if he were twelve. It is painful to read the testimony that has been given in court by great obstetricians. There is no doubt that occasionally a seven or eight months' child is born as fully developed in every respect as most children are at the end of nine months. But thereabouts the limit must be drawn. In Germany the law declares two hundred and ten days to be the shortest time of uterogestation. Here we are not bound by any law, but the lowest limit for full development cannot be placed much below that mark in any case. A fœtus of six months differs very materially from one born at the usual term.

CHAPTER XV.

DEVELOPMENT OF THE FŒTUS IN EACH LUNAR MONTH.

In describing the development of the fœtus it is convenient to divide the average time of two hundred and eighty days, or forty weeks, into ten parts, each of four weeks; but the reader will bear in mind the great individual variations in regard to rapidity of development, and that the two hundred and eighty days are counted from the first day of the last menstruation, while fecundation of the ovum and the development of the embryo begin later. In some cases the real age of the embryo can, however, be ascertained with more or less accuracy.

First Month.—The youngest human ova known belong to the end of the first or beginning of the second week. On page 29 we have seen a reproduction of that described by Peters (Fig. 43), showing the embryo in the form of a flat disk lying on the yolk-sac. In the youngest ovum of Spee (Figs. 65, 66) development has progressed a little farther. The embryo is connected with the chorion by means of a short, thick stalk, called the *abdominal stalk*, which later is developed to the umbilical cord. The primitive groove is visible and the medullary tube is forming.

Fig. 67 represents part of the same ovum, showing that the amnion was already closed. Fig. 68 shows a section of the same ovum. The allantois is growing into the abdominal stalk. This ovum was expelled one week after the non-appearance of the expected menses. An ovum of a slightly older date, but belonging to the first half of the second week, is represented diagrammatically in Figs. 69 and 70.

In Fig. 71 is shown a human ovum between 12 and 13 days old. It measures five millimetres in diameter. The chorion is covered with villi and on being opened reveals the embryo lying flat on the large yolk-sac.

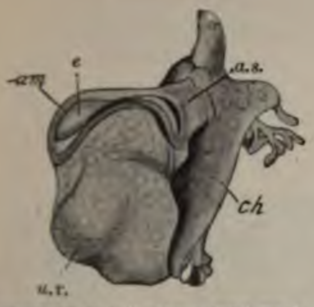
Fig. 72 represents a human ovum of about 14 days.

The embryo represented in Fig. 73 ranges probably between the two last mentioned. The slightly curved embryo is bound to the chorion by the thick abdominal stalk. On the yolk-sac are seen blood-vessels belonging to the second circulatory system.

In the embryo represented in Fig. 74, which is from 16 to 18 days old, the amnion still hugs closely the embryo. The upper and lower extremities are budding and the postoral arches have appeared.

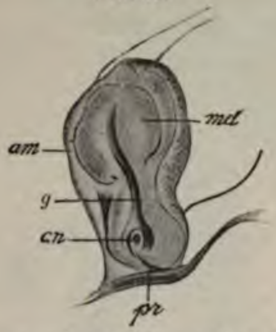
Fig. 75 shows the development at the end of the third week. The visceral arches are four in number with the clefts between them. The intestine has become tubular and the vitello-intestinal communication

FIG. 65.



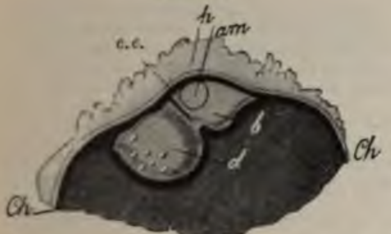
Human embryo in the second week, side view (Spee's ovum). *am*, amnion; *e*, embryo; *u.v.*, umbilical vesicle; *a.s.*, abdominal stalk connecting embryo with chorion; *ch*, chorion.

FIG. 66.



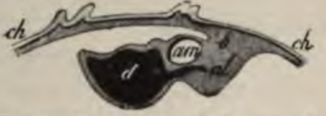
Human embryo in the second week, seen from above (Spee's ovum). *am*, amnion; *md*, medullary canal; *g*, medullary groove; *c.n*, canalis neurentericus; *pr*, primitive groove.

FIG. 67.



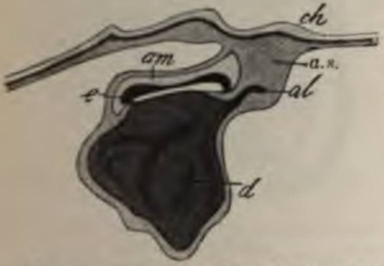
Human ovum in the second week. (Spee.) *Ch*, chorion; *h*, blood-clot; *am*, amnion; *b*, abdominal stalk; *c.e.*, cephalic end; *d*, umbilical vesicle.

FIG. 68.



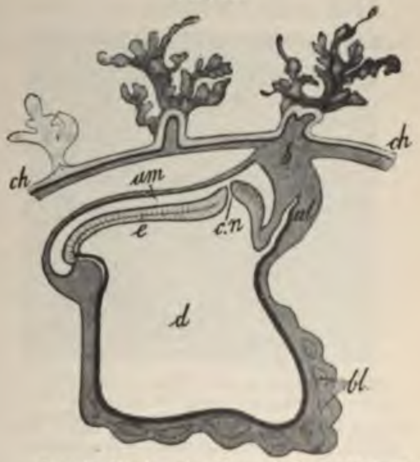
Longitudinal section of the same human ovum in the second week (partly diagrammatic). *ch*, chorion; *b*, abdominal stalk; *d*, umbilical vesicle; *al*, allantois.

FIG. 69.



Human ovum and embryo in the second week, a little older. (Spee.) *ch*, chorion; *am*, amnion; *e*, embryo; *a.s.*, abdominal stalk; *al*, allantois; *d*, yolk-sac.

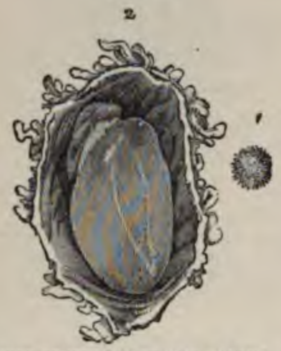
FIG. 70.



Longitudinal section through the same ovum and embryo. *ch*, chorion; *am*, amnion; *b*, abdominal stalk; *al*, allantois; *e*, embryo; *c.n*, canalis neurentericus; *bl.*, islands of blood on the wall of the yolk-sac.

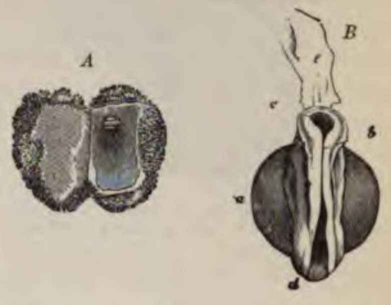
diminished in width. The heart is S-shaped. The rudiments of the eye and ear are visible.

Fig. 71.



Human ovum of from 12 to 13 days. (Allen Thomson.) 1, ovum, natural size, chorion covered with villi; 2, the same opened and magnified seven times. Side view of the embryo lying flat upon the yolk-sac.

Fig. 72.



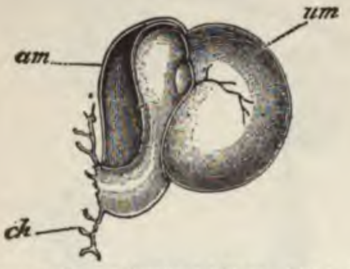
Human ovum and embryo of about 14 days. (Allen Thomson.) *A*, the ovum opened, half the chorion laid to one side and the embryo and yolk-sac seen in the other; natural size, about three times as long as the preceding one.

B, the embryo and yolk-sac viewed from the dorsal aspect, magnified about ten times. *a*, yolk-sac; *b*, hind-brain portion; for a space the medullary canal is here closed; *c*, the mid-brain open superiorly; *d*, hinder part of the medullary canal also open; *e*, portion of membrane, perhaps belonging to the torn amnion.

At the end of four weeks the yolk-sac is pyriform. The heart is well developed. The extremities begin to divide into proximal and middle segments (Fig. 76).

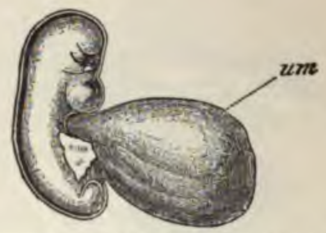
The reader will remark how rapidly the development takes place during this month. At the end of four weeks the embryo measures eight millimetres in length from the vertex to the most prominent point of the tail end, but it is so curved that the measurement taken

Fig. 73.



Human embryo of less than 14 days. (His.) *am*, amnion; *um*, umbilical vesicle; *ch*, chorion.

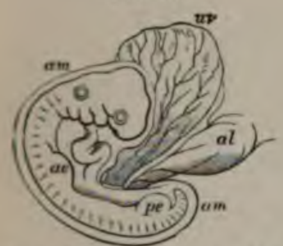
Fig. 74.



Human embryo of 16 or 18 days. (His.) *um*, umbilical vesicle.

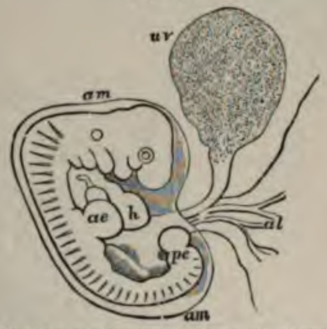
along the back is two centimetres (Fig. 77). The chorion is covered with villi all over. The umbilical vesicle has a narrow stalk. The amnion is spreading on the inside of the chorion. The visceral arches, the eye, and the extremities are plainly visible. Fig. 78 shows the unopened ovum at the end of the first month.

FIG. 75.



Outline of human embryo of fully three weeks. Enlarged five times. (Allen Thomson.) *am*, amnion; *uv*, umbilical vesicle; *al*, allantoid pedicle; *ae*, anterior extremity; *pe*, posterior extremity.

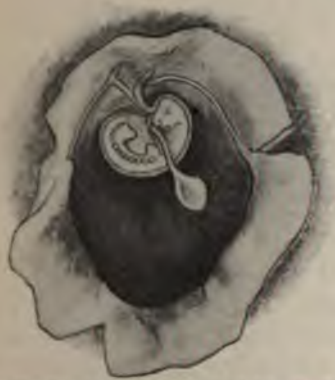
FIG. 76.



Outline of human embryo of about four weeks. Enlarged four times. (Allen Thomson.) *am*, amnion; *uv*, umbilical vesicle; *al*, allantoid pedicle; *ae*, anterior extremity; *pe*, posterior extremity; *h*, heart.

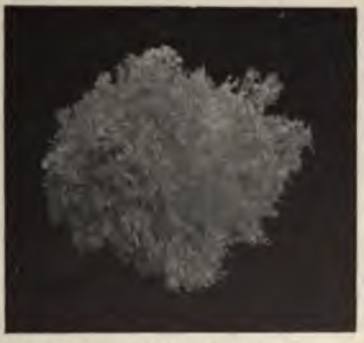
Second Month.—The embryo grows from 8 millimetres to 2½ centimetres. During the first half it can hardly be distinguished from that of an animal. The curvature from head to tail diminishes. The abdomen is protruding in consequence of the growth of the liver. The extremities show a tripartite division. The rudimentary hands

FIG. 77.



Human ovum with embryo of four weeks. Natural size. (Waldeyer.)

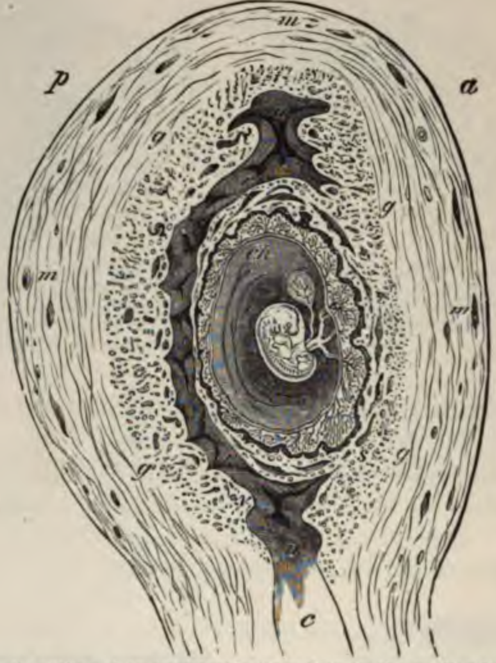
FIG. 78.



Human ovum at the end of the first month. (Wood's Museum, Bellevue Hospital, No. 1193.) Actual size.

and feet appear. In the second half of the second month the embryo acquires the form characteristic of the human being and henceforth is called *fœtus*. The external nose, the external ear, and the external genitals are being formed (Figs. 79–84). Fig. 85 shows the fœtus and ovum at the end of the second month.

FIG. 79.



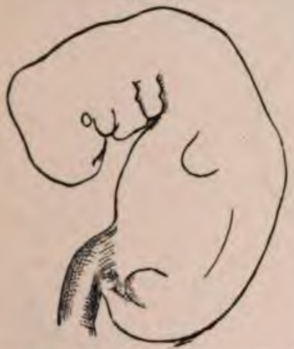
Semi-diagrammatic outline of an anteroposterior section in the median line of a gravid uterus and ovum of five weeks. (Allen Thomson.) *a*, anterior wall of uterus with attached placenta; *p*, posterior wall; *m*, muscular substance; *u*, uterine cavity; *v*, decidua vera, forming grooves and prominences on its surface and showing glands and blood-vessels in its interior; *g g*, the basic part of the decidua, containing the deepest part of the glands; *s*, decidua serotina; *r*, reflexa; *ch*, chorion with villi, which are more developed on the portion turned towards the serotina than on that covered with the reflexa; *e*, embryo enclosed in tight-fitting amnion; the pedunculated yolk-sac with the omphalomesenteric vessels is seen above, and the allantoic vessels below, passing into the placenta.

Third Month.—The ovum becomes as large as a goose-egg. The fœtus measures 9 centimetres in length. The intestine has withdrawn from the navel. In most bones are found points of ossification. Fingers and toes with their nails can be plainly distinguished. The external genitals begin to show sexual differences.

Fourth Month.—The fœtus is from 10 to 17 centimetres long. The difference in the genitals of the male and female fœtus is manifest. The intestine contains meconium (Figs. 86 and 87).

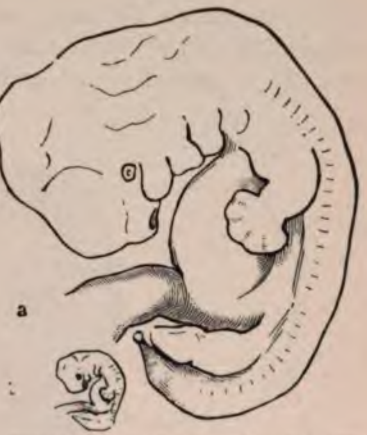
Fifth Month.—The fœtus is from 18 to 27 centimetres in length. The skin loses some of its translucency. Hair appears on the head,

FIG. 80.



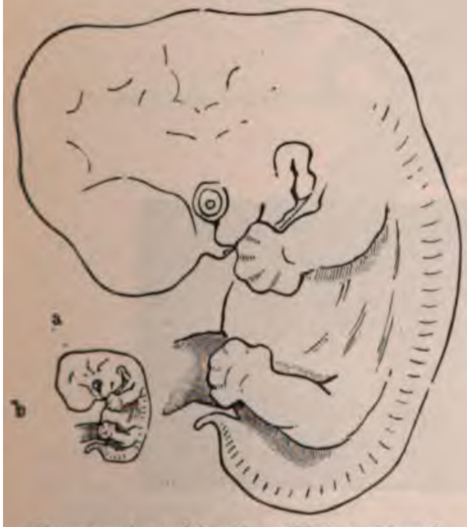
Human embryo of second month, from 8 to 10 millimetres long. Enlarged five times. (His.)

FIG. 81.



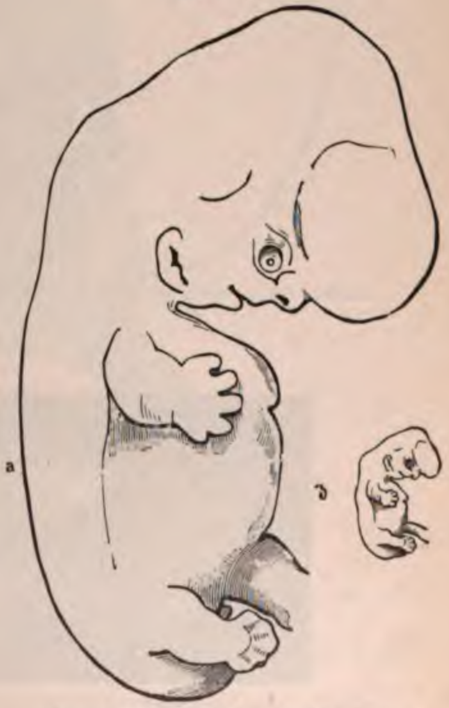
Human embryo of nearly 5 weeks. (His.) *a*, enlarged five times; *b*, natural size (11 mill.-metres).

FIG. 82.



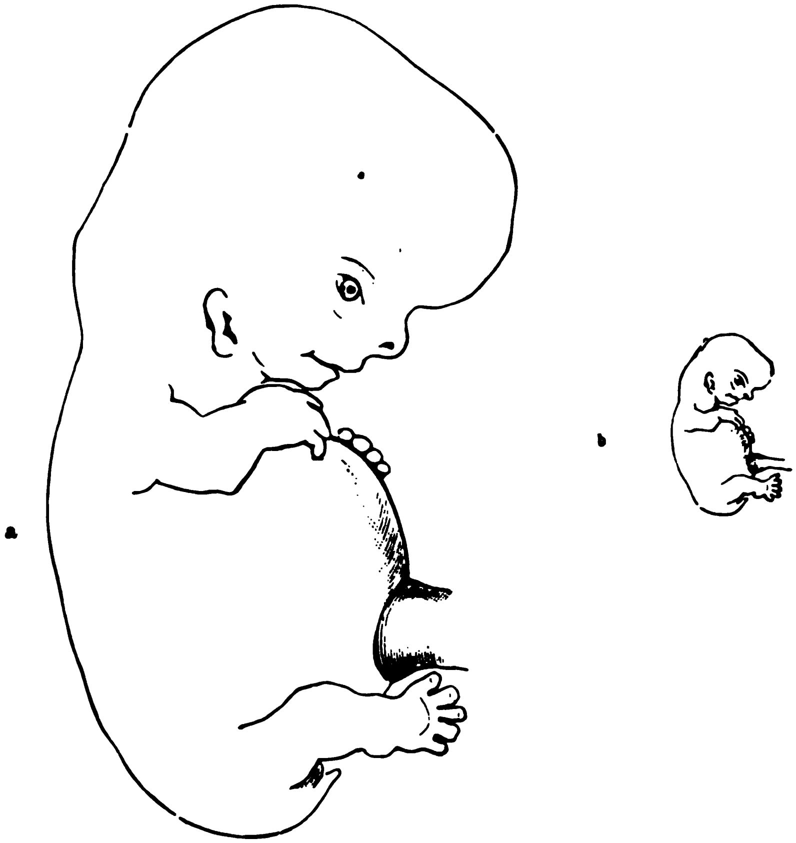
Human embryo of 6 weeks. (His.) *a*, enlarged five times; *b*, natural size (13 millimetres).

FIG. 83.



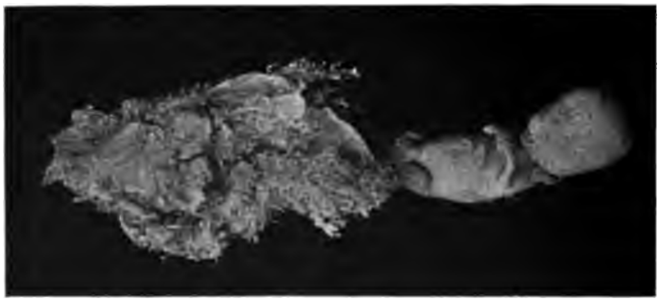
Human embryo about 7 weeks old. (His.) *a*, enlarged five times; *b*, natural size (18 millimetres).

FIG. 84.



Embryo about 8 weeks old. (His.) *a*, enlarged five times; *b*, natural size (23 millimetres).

FIG. 85.

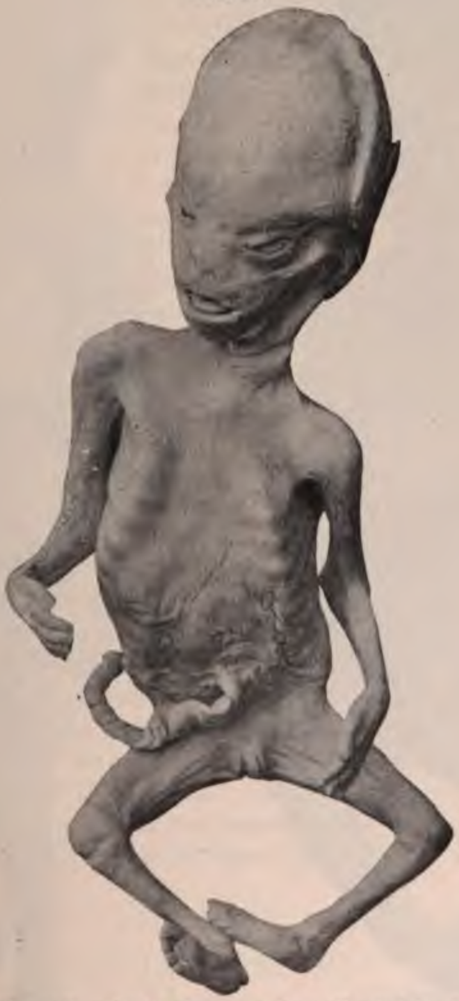


Human ovum and fœtus at the end of the second month. (Wood's Museum, Bellevue Hospital, No. 1197.) Actual size.

and the whole body is covered with small soft hairs, called *lanugo* (Fig. 88).

Sixth Month.—Length of fœtus from 28 to 34 centimetres. Adipose tissue begins to form under the skin, which is full of wrinkles. The head is still very large in proportion to the body. In the sixth month a fœtus may be born alive, gasp, and move the extremities, but it dies invariably within a short time.

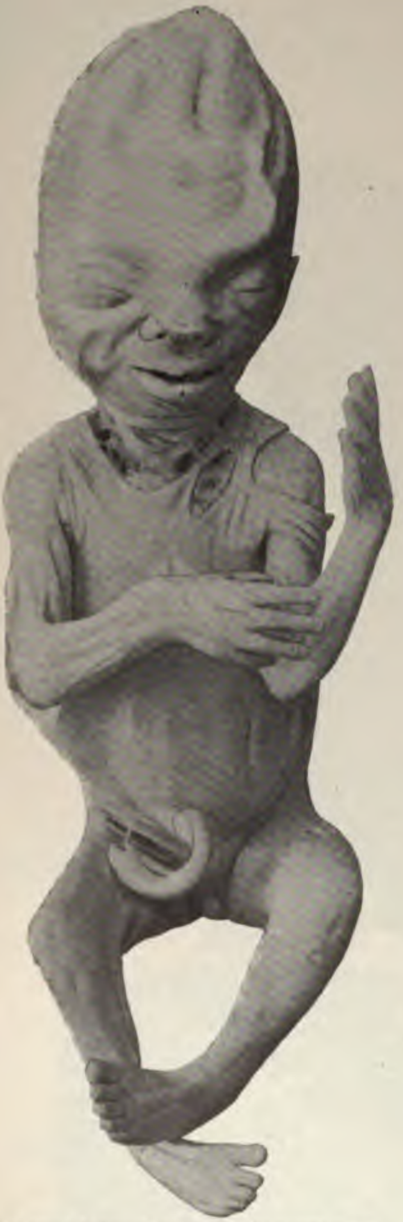
Fig. 86.



Human fœtus, fourth month. (Wood's Museum, Bellevue Hospital, No. 1198.) Actual size.

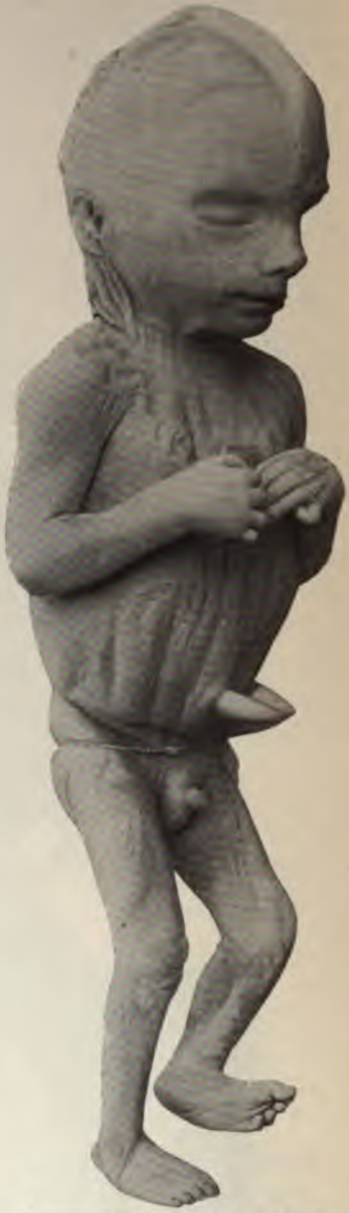
Seventh Month.—The fœtus is from 35 to 38 centimetres long. The eyelids are separated. The body is still lean; the skin is red and

Fig. 87.



Human fœtus at the end of the fourth month. Actual size. (Wood's Museum, Bellevue Hospital, No. 1201.)

Fig. 88.



Human fœtus of fifth month. Five-sixths of the actual size. (Wood's Museum, Bellevue Hospital, No. 1203.)

covered with a yellow, greasy substance called *vernix caseosa*. Children who are the products of a uterogestation of between twenty-four and twenty-eight weeks may show lively movements, but the voice is weak and they nearly always die in the course of a few hours or days. Since the introduction of incubators, several children born between the twenty-seventh and the twenty-ninth week and weighing only two pounds or less (nine hundred and fifty grammes) have been reared.

Eighth Month.—The child acquires a length of 42½ centimetres and a weight of nineteen hundred grammes (nearly four pounds). The pupillary membrane disappears. Children born in this period, although stronger than those of seven months, are still apt to die soon.

Ninth Month.—The child is 46¾ centimetres long and weighs on an average two thousand five hundred grammes (five pounds). The development of adipose tissue rounds out the contours and obliterates wrinkles. Children born between the thirty-second and the thirty-sixth week have not the same power of resistance as those born at full term, but with proper care they survive, as a rule.

Tenth Month.—The fœtus measures on an average about 50 centimetres (20 inches) and weighs on an average 7⅔ pounds. This, at least, was the mean weight found by Lusk in two hundred children born in Bellevue Hospital, New York. In different German cities the averages found were only 6⅘, 6½, and 6⅕ pounds. When we compare these weights, it must, however, be taken into consideration that the Germans and French by a pound mean 500 grammes, while our avoirdupois pound weighs only 453.59 grammes,—nearly fifty grammes less. The weight found by Lusk equals three thousand four hundred and seventy-seven grammes; Leopold mentions three thousand two hundred as the average weight in the Dresden clinic. We shall, therefore, not err much by taking 7 pounds as the general average.

During this last month the lanugo disappears gradually, but is still visible, especially on the shoulders. The ends of the nails do not at first reach the tips of the fingers. The cartilage of the ear and nose is soft. The skin is still red, but smooth. In the latter part of this month the fœtus develops all the signs of a full-born child.

CHAPTER XVI.

VIABILITY.

In certain lawsuits the medical expert has to testify on the questions whether a child was born alive and whether or not it was viable. From the facts above stated it appears that the youngest age at which a child may be reared is after a uterogestation of twenty-six weeks, or one hundred and eighty-two days. The Code Napoléon stipulates one hundred and eighty days as the shortest limit within which a viable child can be born, and in France viability is required in order to inherit and transmit property. The Scotch law even places the limit at one hundred and sixty-eight days, or twenty-four weeks.

CHAPTER XVII.

MATURITY OF THE FŒTUS.

We have seen above that the time required for the full development varies within widely separated limits. We must, therefore, look for signs that are indicative of a mature fœtus. The new-born child, if it is mature, has a characteristic general appearance. All its parts are well rounded out by an abundant mass of subcutaneous adipose tissue, and it has none of the old-man appearance so striking at an earlier stage of development. The color in the Aryan race is what is commonly called white, but which is in reality a mixture of pink and pale yellow. In the negro it is somewhat darker, especially on the scrotum and the labia majora. The length is about twenty inches. The weight varies so greatly that it is much less reliable than the length. As an average we take about seven pounds (3175 grammes). Parents feel a peculiar pride in having heavy children, and to please them midwives exaggerate the supposed weight of the child. The heaviest baby that I have delivered weighed eleven and three-fourths pounds, and the heaviest I have seen in a museum weighed fifteen pounds. Large statistics from European lying-in hospitals show a decided influence of race and locality, even in the same people. The size of the parents has much to do with that of the child. Thus, Robert P. Harris states that Mrs. Bates, a woman known as the Nova Scotia giantess, who was seven feet nine inches high and married to a man of seven feet seven inches, gave birth, in Ohio, to a child weighing twenty-three and three-fourths pounds and having a length of thirty inches. In repeated pregnancies, up to the seventh, the children become larger.

The child is covered with a considerable amount of vernix caseosa, a yellowish, smeary substance found more or less all over, but especially abundant in the armpits and the groins. It is composed of the secretion of the sebaceous glands, epidermis cells, and shed lanugo hairs. The scalp is covered with a growth of hair, usually of a dark color and about an inch long. The lanugo has disappeared from most of the body and is found only on the shoulders.

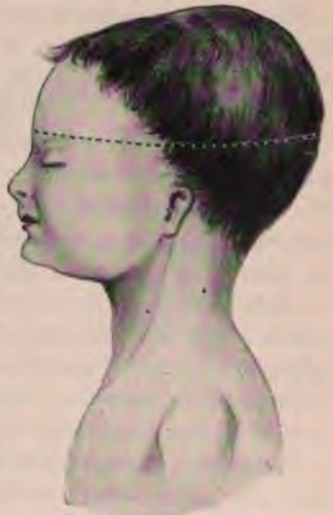
The navel-string is in the earlier months inserted comparatively near the lower end of the body, but from the seventh or eighth month it remains inserted a little below the middle between the ensiform process and the symphysis pubis, the proportion being as 1 to 1.6. The nails protrude over the tips of the fingers, but on the toes they are a little behind. Their consistency is firm. Before the end of the seventh month the pupil is closed by a fine membrane carrying blood-vessels, the *pupillary membrane*, which thereafter disappears. The cartilages in the nose and ears are firm, and the outer ear stands out separated from the skull. The cranial bones are hard and the sutures between them narrow. The circumference of the thorax, inclusive of the shoulders, is larger than the horizontal circumference of the head at the base of the forehead (Fig. 89). The thorax is larger than the abdomen.

The sebaceous glands, which in earlier months form comedones on the nose and lips, are now seen only on the tip of the nose.

The scrotum is strongly wrinkled and contracts powerfully. The testicles enter the inguinal canal in the seventh month, arrive in the upper part of the scrotum in the eighth, and are found at the bottom of the same in the tenth. The labia majora, as a rule, cover the labia minora.

The child cries with a strong voice. If a finger is passed into its mouth, it sucks with force. Soon it voids the urine and the meconium, a tarry, dark-green or black substance accumulated in the lower part of the bowel, and composed of biliary pigment, taurocholic and glycocholic acids, cholesterin, mucus, horny epidermal scales, and down from the skin. It does not contain any albuminoids, the fœtus having utilized them all in the development of its body. Among inorganic substances the sulphates and chlorides of alkalies prevail.

FIG. 89.



Horizontal circumference of the head.

The child makes lively and strong movements with its extremities. In the lower epiphysis of the femur an ossified nodule about a quarter of an inch in diameter is found in most cases.

Some information as to the maturity may even be found in the after-birth; the weight and size of the placenta should be noticed, as well as the thickness of the umbilical cord. The presence of blood-vessels in the decidua outside of the placenta is a sign of immaturity. After the thirty-second week scratches on the inside of the amnion may be seen with the naked eye or at all events with a lens. They are produced by the finger-nails of the fœtus.

Many circumstances influence the growth of the child. Thus, twins are, as a rule, smaller than the average single child and weigh less. Severe illness in the mother, especially syphilis, retards development.

CHAPTER XVIII.

OVUM AND PLACENTA AT TERM.

At the end of pregnancy the ovum fills and extends the uterine cavity and in primiparæ even the upper portion of the cervical canal. It is composed of the three membranes—decidua, chorion, and amnion—and contains the fœtus, with the umbilical cord and the liquor amnii.

The separation between the uterus and the ovum at birth takes place in the loose ampullar portion of the decidua, so that the deepest, the basic part, remains in the maternal body. We know from the history of development that, with the exception of that part where the placenta is situated, the decidua is composed of two layers, the decidua vera and the decidua reflexa, but they grow so intimately together that it is difficult or impossible to separate them from each other at the end of gestation. On the placenta the decidua serotina forms a thin gray layer, which follows all its sinuosities and may be torn from the underlying chorion with a thumb-forceps.

Under the decidua lies the chorion, lightly attached to it, so that they are easily separated from each other all over the ovum outside of the placenta. All the villi and their vessels have disappeared, except at the placental site, where, on the contrary, they have grown so that they form the larger part of the bulk of the placenta.

Inside of the chorion and loosely attached to it lies the amnion, a thin, transparent, smooth membrane. Its outer portion is formed of connective tissue, a continuation of the skin of the fœtus. The inside is formed of a single layer of cuboidal epithelium, corresponding to the epidermis of the fœtus. The amnion lines the whole ovum and forms a sheath for the umbilical cord. It has neither nerves nor vessels.

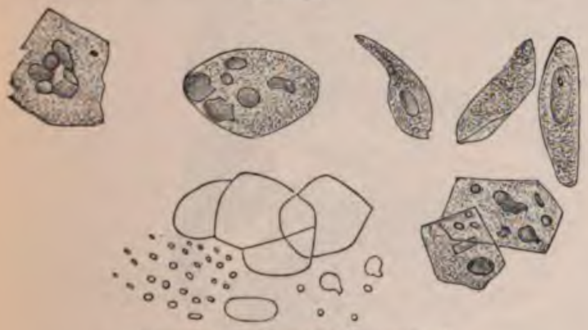
Between the chorion and the amnion is found a thin albuminous layer that does not show any organization, and which is a remnant of the albuminous fluid separating the two membranes at an earlier stage. It is called the *tunica intermedia of Bischoff*, or *magma réticulé of Velpeau.*

The LIQUOR AMNII fills the space between the ovum and the fœtus.

It is of a dirty yellowish-gray color, serous, turbid, full of small white flocculi, slightly alkaline, and it has the peculiar, somewhat nauseous odor of the female genitals. It does not coagulate spontaneously nor on being boiled, but it does so when a drop of acetic acid neutralizes the alkalinity of the fluid. The precipitate becomes much clearer by adding liquor potassæ.

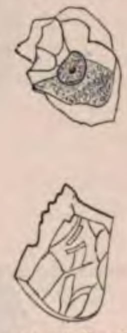
The microscope reveals the presence of oil-globules, irregular fat-granules, and large flat cells containing fatty masses like those found free in the fluid (Fig. 90). When ether is poured on a drop of the fluid, the fat is drawn out of the cells, which then look shrivelled and show an irregular mesh-work; in some a nucleus is visible (Fig. 91).

FIG. 90.



Microscopical elements in liquor amnii.

FIG. 91.



Liquor amnii cells, the fat of which has been drawn out with ether.

These cells are changed fetal epidermis-cells, those of the amnion being cuboidal, or short columnar, not flat.[1]

The liquor amnii has a specific gravity varying between 1006 and 1012. It contains nearly as much salts as the serum of the blood,—namely, five parts per thousand. They are phosphate, sulphate, and carbonate of sodium, phosphate and sulphate of lime, and traces of potassium. Towards the end of pregnancy the fluid contains also a little urea (see p. 45). Hairs of detached lanugo are swimming in it. It has experimentally been proved to be a transudation partly from the fetal and partly from the maternal blood, with which fetal urine mixes.

The amount of liquor amnii in the mature ovum varies very much. Leaving out extremes, we may say that it is between one pint and four pints.

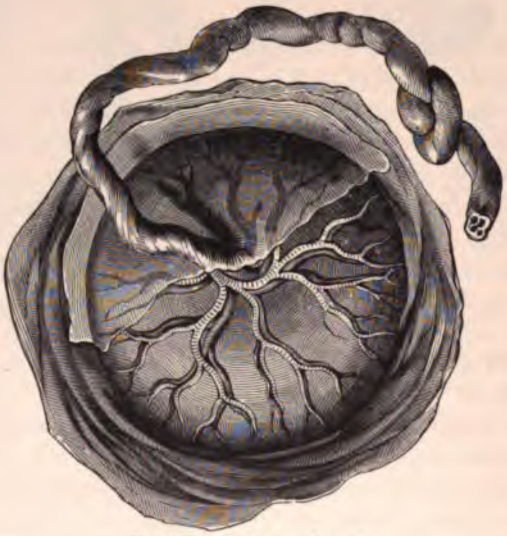
The liquor amnii is useful in many ways, both during the development of the fœtus and during labor. This fluid supplies the fœtus with the water necessary for its growth and contributes to its nourishment. In order to be assimilated by the fœtus the nutriment coming from the mother must come in contact with a fluid less dense than the maternal blood in which it is dissolved. The liquor amnii takes up the urine occasionally voided by the fœtus and protects the fœtus against injury. The liquor prevents parts of the fœtus from coalescing and favors the free development of the limbs. It allows the fœtus to move in the uterus and to be placed in the most favorable way for expulsion from the same. It distributes evenly the pressure exercised by uterine contraction, serves to open the cervix and protect this against pressure, and, finally, lubricates and moistens the parturient canal.

---

[1] Garrigues, Diagnosis of Ovarian Cysts by Means of the Examination of their Contents, New York, 1882, p. 68.

The PLACENTA is a circular mass or oval body, from six to eight inches in diameter and about one inch thick in the centre, becoming thinner towards the periphery. On the fetal side (Fig. 92) it is smooth, of a grayish color, and covered with the amnion, which, however, is so loosely attached that they may very easily be separated from each other. Under the transparent amnion are seen the ramifications of the umbilical vessels. On the maternal side (Fig. 93) is the thin, gray layer of decidua, and under that are the dark-red villi of the chorion. This side is uneven, being divided by deep furrows into small roundish islands called *cotyledons*. The decidual portion is called the *maternal placenta*, while those parts belonging to the chorion and amnion constitute the fetal placenta.

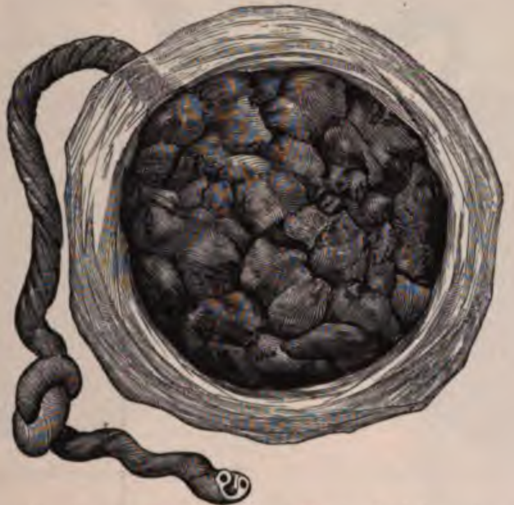
FIG. 92.



Fetal surface of the placenta.

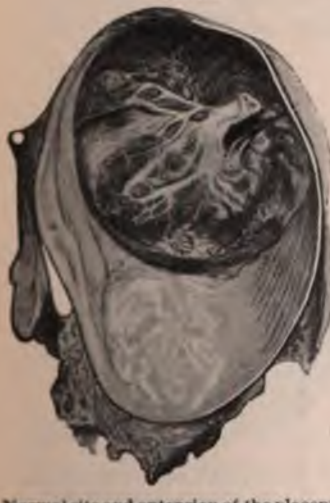
The placenta is, as a rule, produced either on the anterior or the posterior wall of the uterus (Fig. 94). The upper end extends into the fundus, while the lower remains about four inches above the internal os. It is situated a little higher in primiparæ than in those who have borne children.

FIG. 93.



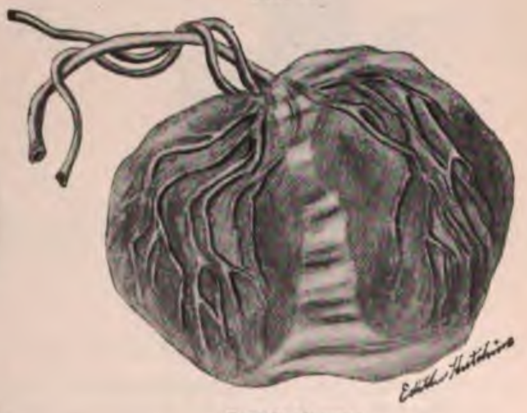
Maternal surface of the placenta. The decidual portion is called the maternal placenta, while those parts belonging to the chorion and amnion constitute the fetal placenta.

FIG. 94.



Normal site and extension of the placenta at the end of pregnancy. (Küstner.)

FIG. 95.

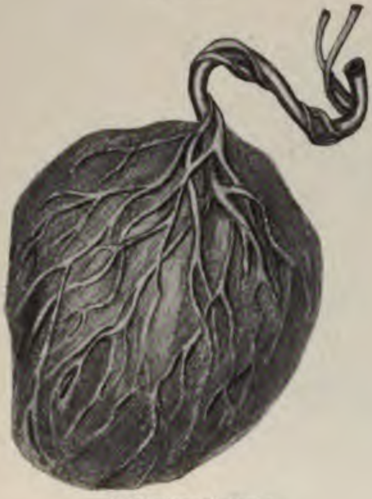


Double placenta.

If the formation of the placenta begins at the edge of the uterus, it becomes divided into two halves, one on the anterior and one on the posterior wall, separated by a thin portion without villi (Fig. 95).

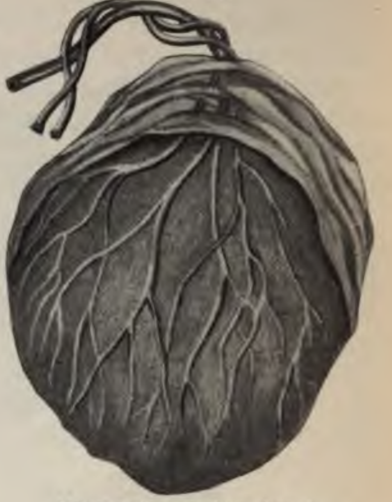
The UMBILICAL CORD extends from the abdomen of the fœtus to the placenta. It is about twenty inches long, the same as the fœtus. It is turned in a spiral with more or less windings. As a rule, it is turned to the left (seen from the fœtus), more rarely in the opposite direction. It is in most cases inserted at or near the centre of the placenta—*central insertion* (Fig. 92), sometimes at the margin—*marginal insertion*, or *battledoor placenta* (Fig. 96), and in rare cases on the membranes at some distance from the placenta—*velamentous insertion*

FIG. 96.



Battledoor placenta.

FIG. 97.



Velamentous insertion of cord.

FIG. 98.

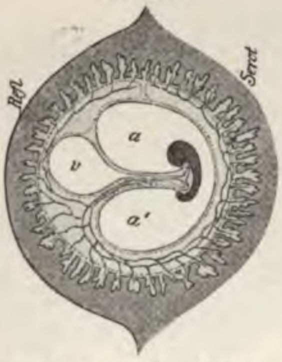


Diagram of origin of the velamentous insertion of the umbilical cord. (Ahlfeld.) *Serot.*, decidua serotina; *Refl.*, decidua reflexa; *a*, cephalic fold of amnion; *a'*, caudal fold of amnion; *v*, vesicula umbilicalis grown to chorion.

FIG. 99.

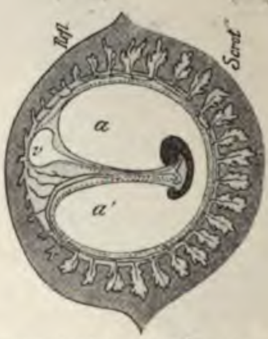
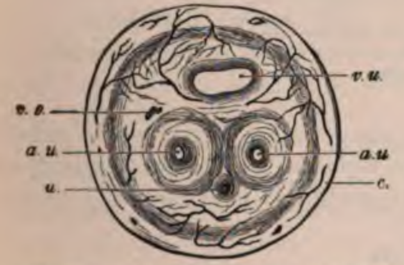


Diagram of origin of velamentous insertion. (Ahlfeld.) The umbilical cord formed. Lettering same as in Fig. 98.

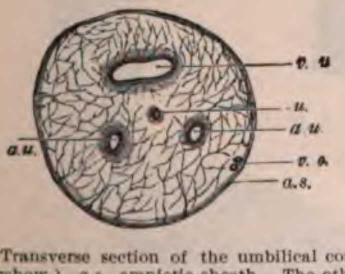
(Fig. 97). The velamentous insertion is probably brought about by an adhesion between the yolk-sac and the chorion, preventing the allantois from extending to the serotina. (See p. 42 and Figs. 98, 99.) Still more rarely the umbilical cord separates into two branches before reaching the placenta—*forked insertion.* The cord is usually as thick as an index-finger, sometimes as the little finger, and sometimes it is as thick as a thumb or even thicker. The thick cords are called *fat* and the thin ones *lean*, but the difference in thickness depends chiefly on the larger or smaller amount of the *gelatin of Wharton.*

FIG. 100.



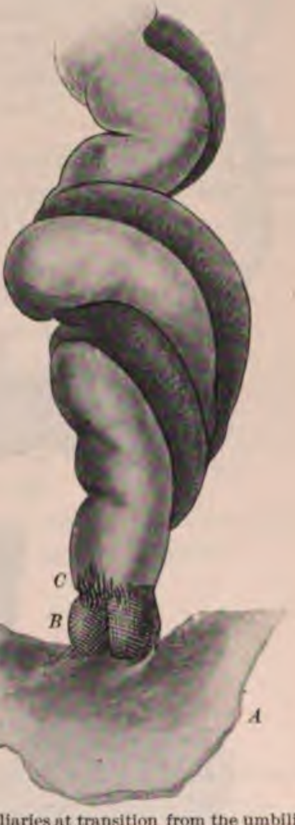
Transverse section of the umbilical cone. (Virchow.) *c.*, skin with blood-vessels; *v.u.*, umbilical vein; *a.u.*, umbilical arteries; *v.o.*, remnants of the vitelline duct and the omphalomesenteric blood-vessels; *u.*, remnants of the allantois (urachus).

FIG. 101.



Transverse section of the umbilical cord (Virchow.) *a.s.*, amniotic sheath. The other letters same as in Fig. 100

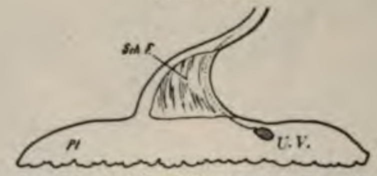
FIG. 102.



Capilliaries at transition from the umbilical cone to the umbilical cord. (Virchow.) *A*, abdominal wall; *B*, permanent portion of the umbilical cord, or abdominal umbilicus; *C*, capillaries at boundary-line.

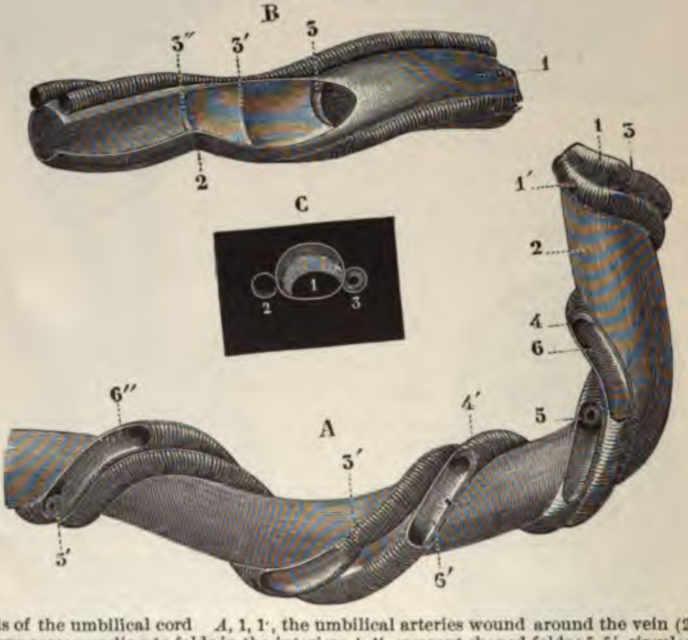
The cord is composed of two arteries, one vein, the epithelial remnants of the allantois, the gelatin of Wharton, and a sheath formed by the amnion (Figs. 100, 101). It has no nerves or vessels of its own, except quite near the line of demarcation between it and the fœtus, where some capillaries extend a short distance on the cord (Fig. 102). This boundary-line is quite sharp, a little cone covered with skin being in contact with the cord, that is covered with the amnion sheath. At the insertion on the placenta are found some small, mostly flat epithelial growths. The *umbilical vesicle*, the remnant of the yolk-sac, is not found in the cord itself, but it is found in nearly every case at some little distance from the placenta, between the chorion and the amnion, adherent to the latter, or on the placenta under the amnion. By pulling on the cord a fold of the amnion is

FIG. 103.



Fold of Schultze. *Pl.*, placenta; *U V.*, umbilical vesicle with vitelline duct; *Sch. F.*, fold of Schultze

FIG. 104.

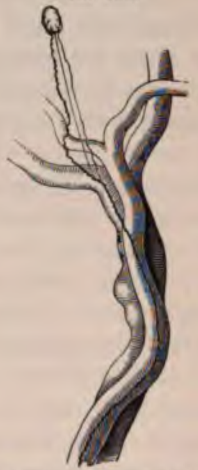


Vessels of the umbilical cord *A*, 1, 1′, the umbilical arteries wound around the vein (2); 3, 3′, constrictions corresponding to folds in the interior; 4, 4′, crescent-shaped folds; 5, 5′, circular or diaphragmatic fold; 6, 6′, 6″, openings cut in the wall of the arteries. *B*, 1, the umbilical vein partly cut open; 2, constriction; 3, 3′, 3″, crescent-shaped folds. *C*, transverse section of the vein and arteries; 1, crescent-shaped fold in the vein; 2, crescent-shaped fold in one artery; 3, diaphragmatic fold in the other artery raised between the cord and the placenta, the outer margin of which is formed by the remnant of the vitelline duct (Fig. 103).

The two umbilical arteries keep together and are wound in a spiral around the single vein. Immediately above their entrance into the placenta there is a large anastomosis between the two, insuring an even distribution of blood throughout the placenta. The arteries, as well as the vein, have semilunar and circular folds, or incomplete valves, marked outside by a constriction of the vessel (Fig. 104). The vein is much more voluminous than both arteries together (Fig. 101).

The remnant of the umbilical vesicle is a small white body, about a line long. From it extends sometimes a fine thread in the interior of the umbilical cord, which is the upper part of the same vesicle, the vitelline duct, or omphalo-enteric duct. Sometimes even remnants of the old omphalomesenteric vessels can be distinguished (Fig. 105).

FIG. 105.



Remnant of the umbilical vesicle and omphalomesenteric vessels. (Hartmann.) The large vessels are branches of the umbilical artery and vein in the placenta.

The gelatin of Wharton is a continuation of the connective-tissue layer of the amnion and the subcutaneous connective tissue of the fœtus. It is a rather loose connective tissue mixed with elastic fibres, and serves to protect the vessels of the cord against pressure.

CHAPTER XIX.

CAUSE OF THE SEX OF THE FŒTUS.

MANKIND is doubly interested in the question if by any means we can produce one sex preferably to the other. Parents, as a rule, desire their offspring to be of the male sex. Not only are realms and large estates in many cases transmissible only to a male heir, but even those on whom fortune has not lavished her sweetest smiles think of the time when the boy can make himself more useful than a girl and acquire independence, while his sister is waiting for a husband to take care of her. On the other hand, as agriculturist—and we all ultimately depend on husbandry for our living—man wants a preponderance of cows and other female domestic animals. From olden times he has, therefore, busied himself to find means to accomplish his wish to be able to decide or, at least, to influence the production of the sex wanted in the offspring. Most of the postulates in regard to the power of determining the sex at will are so absurd that they are not worth repeating, and even modern scientific men have advanced theories which combat one another. Thus Ploss thought that by feeding the mother well he could produce a preponderance of girls, while Schenck, the latest champion in the field, teaches that the male fœtus has more red blood-corpuscles than the female, that the father has no influence in regard to the formation of sex in the offspring, and that consequently by producing rich blood in the mother he can force nature to produce boys. It would, however, be strange if the father, from whom the progeny certainly can inherit the form of the body, all the details that make up a physiognomy, personal peculiarities, such as the color of the skin and the hair, tendencies, talents, characteristic movements, diseases, etc., were not able to exercise the slightest influence on such a gross difference as the sex of his child. Hofacker and Sadler contended, based on statistics, that the age of the parents had a decided influence, the old male in conjunction with a young female being more apt to procreate boys: a theory that meets with some degree of countenance among agriculturists, who always use young bullocks to cover their cows. According to Thury, the time of copulation has some influence on the sex, copulation at the beginning of the rut giving more female calves and at the end of the rut more male calves. This theory has in a modified form been applied to mankind, and many believe that coition shortly before menstruation preferably gives rise to the birth of girls, and that practised shortly after the menstrual period it is more likely to result in the production of boys. The experience of one man goes for naught in this question, the conclusions drawn from even pretty large statistics from lying-in hospitals having been overthrown by examining still larger numbers.

As a matter of fact, there are born one hundred and six male children for every one hundred females, but, the mortality among the males being greater, this difference disappears at the age of puberty. This proportion is, however, modified by the age of the mother. Thus, in Australia, where, on account of the scarcity of women, they marry young, the proportion of the boys to the girls born is one hundred and twenty to one hundred. But, on the other hand, statistics of European countries show that old primiparæ are more apt to give birth to boys than to girls, even in the proportion of from one hundred and twenty to one hundred and forty boys to one hundred girls.

If an ovum contains more than one fœtus, they are invariably of the same sex, which favors the view that sex is pre-established in the ovum itself.

Some think that originally all ova are female, and only in the course of development may acquire the male type. In support of this theory, attention is called to the fact that double monsters, a deformity which can originate only at a very early stage of development, nearly always belong to the female sex.

Experiments with ova of animals have shown that, while, as a rule, only one spermatozoid enters the ovum, if the ovum is weakened by contact with chloroform, chloral, morphine, nicotine, and other poisons, several spermatozoids may penetrate. Perhaps, then, a weakened condition of the mother in this way may predispose to the formation of a male fœtus.

Statistics prove that great wars, in which hundreds of thousands of men perish, have only an evanescent influence on the proportion between the sexes, male births following in large preponderance. The explanation of this may be that those who are not killed return sexually strong to their wives, who in their absence have been exposed to privations which have reduced their strength. But taking into consideration all these uncertainties and contradictions, is it not rational to suppose that the matter is subject to some regulating power, call it God, Providence, or Nature, who takes care that the balance necessary for the continuation of the species is re-established?

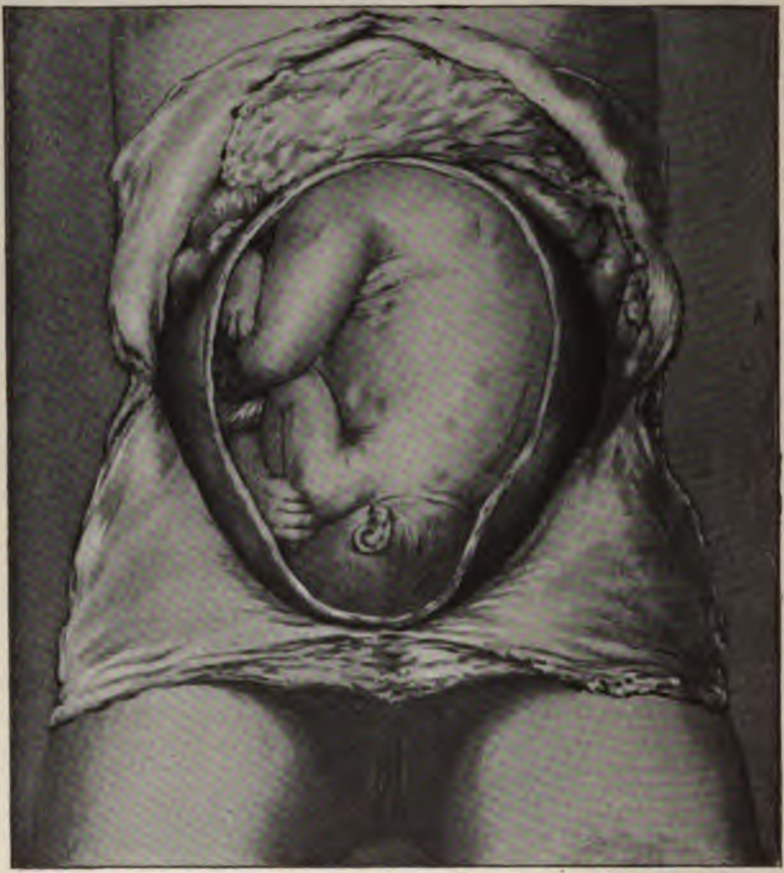
CHAPTER XX.

ATTITUDE, PRESENTATION, AND POSITION OF THE FŒTUS.

THE ATTITUDE of the fœtus is the relation of its different component parts to one another. Towards the end of pregnancy the head is normally bent on the thorax, so that the chin touches the chest. The vertebral column is curved with the concavity forward. The arms lie at the side of the thorax and the forearms are crossed in front of it, the wrists and fingers flexed. The knees are flexed and drawn up in front of the abdomen, and the legs generally crossed. The feet are bent up towards the shins. In other words, the fœtus is pressed by the abdominal walls, the walls of the uterus, and the ovum into the shape in which it takes up the least space (Fig. 106). Partly the attitude is also due to the return of the muscles after each movement to the stage of rest. As a rule, the umbilical cord finds room in the space left between the extremities. Very often it is, however, wound around an extremity, the trunk, or the neck of the fœtus.

PRESENTATION is the relation of the longitudinal axis of the fœtus to that of the uterus. First of all we must distinguish a *longitudinal presentation* from a *transverse* or *cross presentation*, because the first, generally speaking, is favorable to the expulsion of the fœtus from the maternal body, while the second, if neglected, gives rise to grave complications, which imperil the life of both mother and child. The longitudinal presentation is that in which the long axis of the fetal mass practically coincides with the long axis of the uterus. According to the pole of the ovoid formed by the fœtus which presents itself at the mouth of the womb, we divide the longitudinal presentations into *head presentations*, or *cephalic presentations*, and *pelvic end presentations*. Head presentations are again subdivided into the *vertex presentation*, the *face presentation* (Fig. 107), and the *brow presentation*.

FIG. 106.



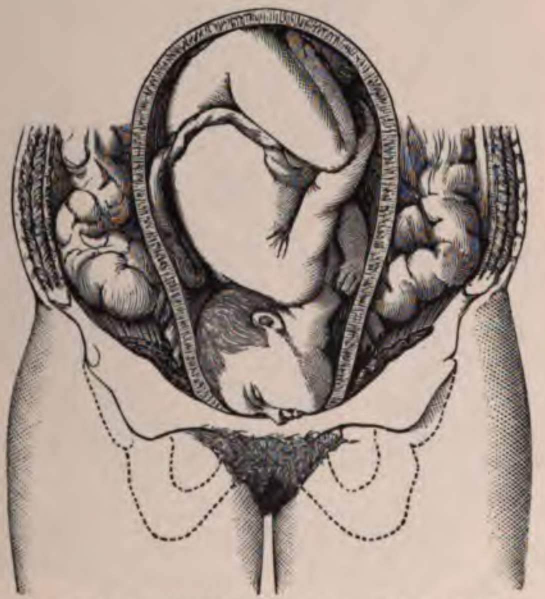
Attitude of the fœtus in the uterus.

Pelvic end presentations are, as a rule, *breech presentations* (Fig. 108), but occasionally one or both knees may be the presenting part —*knee presentation* (Fig. 109), and still more rarely one or both feet occupy the lowest part of the uterus—*foot presentation, or footling presentation* (Fig. 110).

The transverse or cross presentation is the one in which the longitudinal axis of the fetal ovoid coincides more or less with the transverse axis of the uterus. It is also designated as *shoulder presentation* (Figs. 111, 112), because most frequently the shoulder sinks down.

Frequency of Different Presentations.—For obvious reasons, the rarer presentations, which are likely to give rise to complications and call for special skill, occur more frequently in institutions particularly destined for the treatment of labor cases. Thus, the statistics of lying-in hospitals show that there are about ninety-five per cent. vertex presentations, three per cent. pelvic presentations, a little over one-half of one per cent. cross presentations, and about 0.6 of one per cent. face presentations. But by taking the statistics of a large district in Germany with ninety-three thousand eight hundred and seventy-one births, Spiegelberg found 97.3 per cent. of vertex presentations, 0.3 per cent. face presentations, 1.59 per cent. pelvic presentations, 0.78 per cent. cross presentations. It appears from this that vertex presentations are so common that all others must be looked upon as exceptional. The above figures represent, however, only the presentations at term. During pregnancy they change frequently. In the

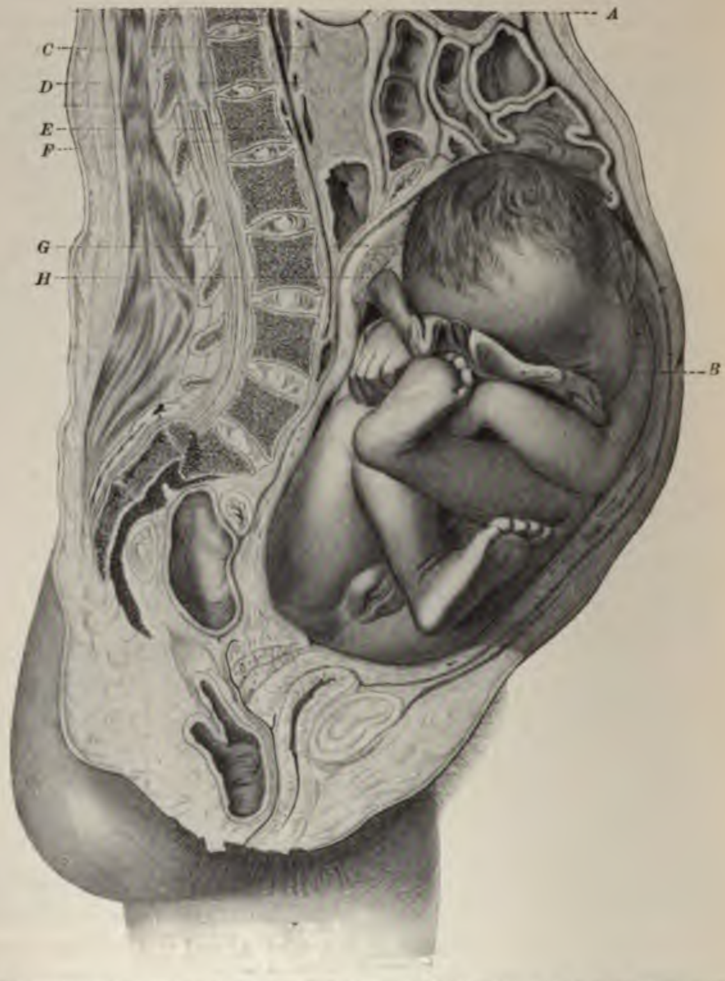
FIG. 107.



Face presentation, left mento-anterior position. (Tarnier and Chantreuil, l. c.)

earlier months the uterus is more globular, there is comparatively more liquor amnii, and the fœtus swims freely around (Fig. 113). Later the uterine cavity becomes pear-shaped, a form which does not allow of so free movements (Fig. 114). Uterine contractions contribute also to the fixation of the fœtus. In primiparæ, where the uterus and the abdominal wall are of a harder texture than in those who have borne children before, there is less scope for change of presentation. In one hundred and fifty abortion cases the cephalic pres-

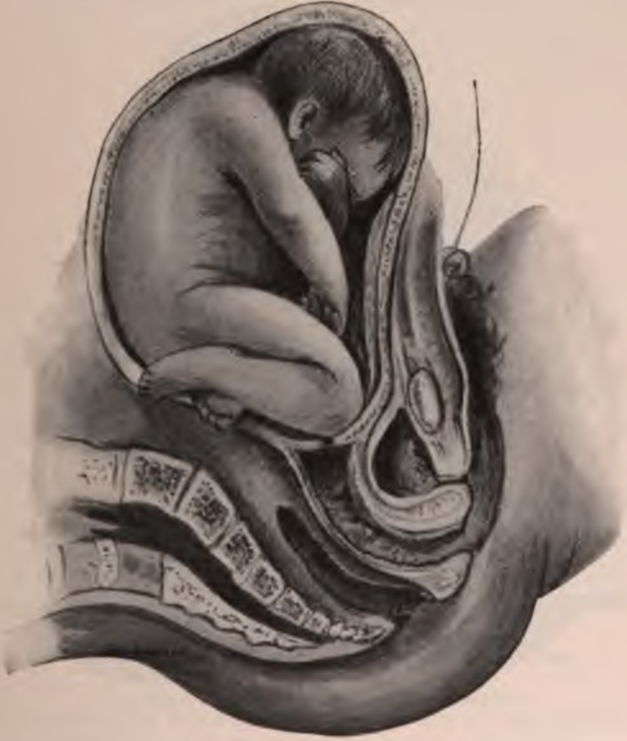
Fig. 108.



Breech presentation, left sacroposterior position. (Waldeyer.) *A*, the great omentum; *B*, umbilical cord; *C*, origin of vena porta; *D*, superior mesenteric artery; *E*, receptaculum chyli; *F*, left renal vein; *G*, wall of the uterus; *H*, placenta. In the accident which caused this woman's death the first sacral vertebra was fractured and depressed in front of the second.

entation was found only in forty-nine per cent., the pelvic in forty-eight, and the transverse in three. In the sixth month the head presents itself already in sixty-six per cent. of cases, and after that the preponderance of the cephalic presentation grows steadily. In pluriparæ a change of presentation is not rare, even shortly before labor. In primiparæ, as a rule, no change takes place during the last three weeks of pregnancy. The head is at that time so engaged in the pelvis that a change hardly can occur. The weight of the fœtus has some influence; the heavier it is, the less it is likely to change presentation. A narrow pelvis, on the other hand, favors change.

FIG. 109.



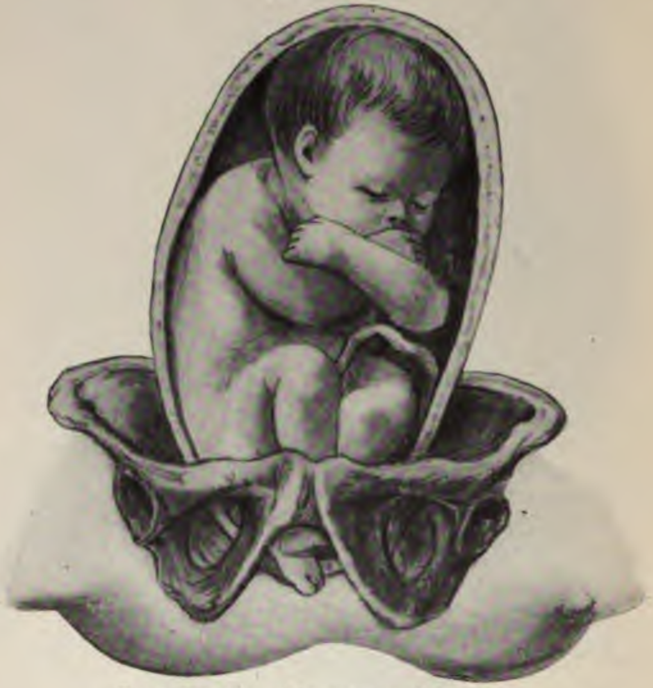
Knee presentation (Charpentier.)

Most frequently transverse presentations are changed into head presentations, more rarely the opposite takes place. Breech presentations often change into head presentations and sometimes the latter are changed to the former. Breech presentations change less frequently to cross presentation and *vice versa*.

The cause of this great preponderance of vertex presentations is probably to be found in the law of gravitation. If the body of a new-born child that has died during labor is immersed in a solution of salt corresponding to its own specific gravity, it assumes a slanting position with the head and the right side turned downward, which is due to the greater specific gravity of the head and the liver. Another theory is that the fœtus moves by reflex movements until it has found the most convenient presentation, which is the cephalic.

In the erect position of the woman the uterus rests on the anterior abdominal wall and forms an angle of about thirty-five degrees with the horizon. If the back of the fœtus is turned forward its head will, by gravitation alone, since it cannot escape backward, sink down on the internal os. If its back is turned to one side, the head will sink to the opposite side. Since now the back by gravity sinks forward and to the left in the erect position of the mother, the fetal head would escape to the right.

FIG. 110.



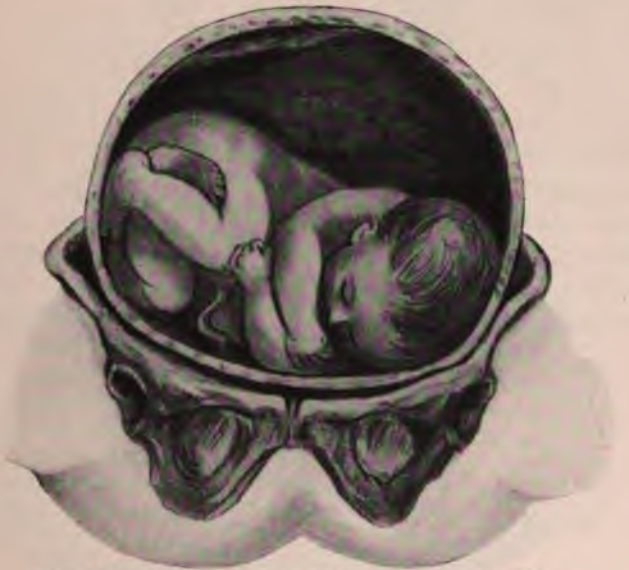
Foot presentation, right sacroposterior position.

When the woman lies on her back the uterus rests on the vertebral column. The back of the fœtus would sink downward and to the right, and the head pass somewhat to the left. When the abdominal wall and the uterine tissue offer little resistance, the head slides, indeed, a little to one side; but when they are firmer, and if muscular contractions diminish the transverse diameter of the uterus, the head is prevented from sliding away, and it remains on the brim of the pelvis.

Again, when the woman lies on her side, the fundus tips down on the same side and the os rises on the opposite. Under these circumstances the head of the fœtus, if freely movable, must sink towards the fundus, and the result will be a pelvic presentation.

When the fœtus dies, its centre of gravity is moved farther down, and it loses its resiliency, which explains why dead fœtuses so often are found with pelvic or cross presentation.

FIG. 111.

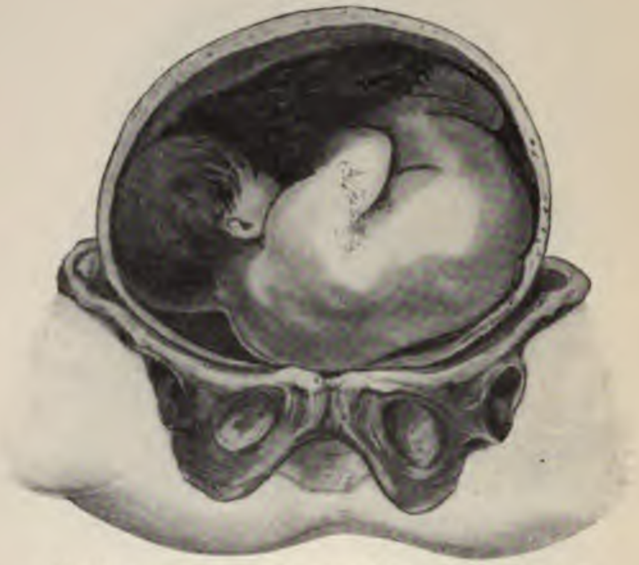


Shoulder presentation, head in left side, dorsoposterior position.

POSITION.—By the technical term "position of the fœtus" is meant the relation between certain points on the presenting part of the fœtus to certain points on the pelvis of the mother. In this place we consider only the different positions connected with the vertex presentation. Commonly the back of the fœtus is turned forward, and much more frequently to the left than to the right; exceptionally it is turned backward and to the right, and least frequently of all it is turned backward and to the left. Accordingly these positions have been designated as the *first*, *second*, *third*, and *fourth* positions respectively. Or, going by what we feel in making a vaginal examination, the first is also called the *left occipito-anterior* position (Fig. 106), the second the *right occipito-anterior*, the third the *right occipitoposterior*, and the fourth the *left occipitoposterior* position. For convenience these long names are often reduced to their initials,—*L. O. A.*, *R. O. A.*, *R. O. P.*, and *L. O. P.* positions. The point we go by is the position of the tip of the occipital bone (or the posterior fontanelle) to the iliopectineal eminence or the sacro-iliac joint. If the long axis of the head lies in a transverse direction in the pelvis, the tip of the occipital bone corresponds to a point at the brim of the pelvis situated in the middle between the iliopectineal eminence and the sacro-iliac joint.

If, as we have seen, the presentation is subject to variation during pregnancy, the position is still more liable to change during both pregnancy and labor. With the vertex presentation the left occipito-anterior position is by far the most common and the left occipitoposterior the least frequent, while authors disagree widely in regard to the comparative frequency of the right occipito-anterior and the right occipitoposterior positions. If we go by the position in which the child is born, there is no doubt about the much greater frequency of the right occipito-anterior position, but in many cases a rotation takes place during labor, by which the back is turned forward, so that the right occipitoposterior position is changed into the right occipito-anterior position. According to the statistics of Paul Dubois, there were in 1813 cases of vertex presentation, left occipito-anterior 1255,

FIG. 112.

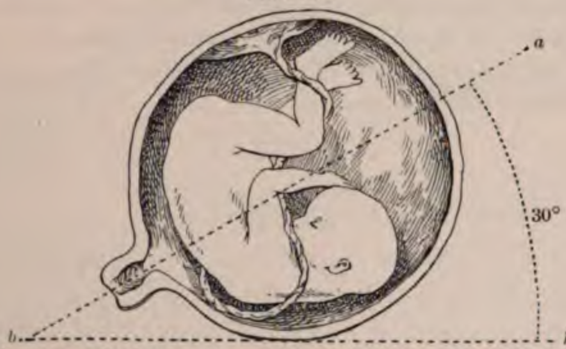


Shoulder presentation, head in right side, dorso-anterior position.

right occipitoposterior 491, right occipito-anterior 55, left occipito-posterior 12.

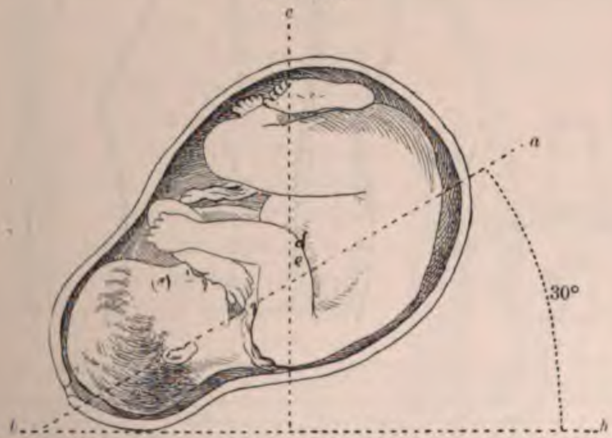
The great preponderance of the left occipito-anterior position is due to gravity. The uterus being inclined forward, when the woman is in the erect position, and the head and back of the fœtus, especially its right side, sinking down, as we have seen in the above-mentioned experiment of suspending the body of a new-born child in a salt solution of its own specific gravity, by mere gravity the head will go down and the back forward. The great frequency of the left occipito-anterior position is due to the position of the mother's rectum, which causes a partial rotation of the uterus, by which its left edge is carried a little more forward than its right edge. Thus the back of the child would not only sink forward but towards the left of the uterus.

FIG. 113.



Fœtus in globular uterus. Early pregnancy. (Duncan.) *a b*, axis of uterus; *b h*, horizontal line.

FIG. 114.



Effect of gravity on fœtus at end of pregnancy. (Duncan.) *a b*, parallel to axis of uterus and pelvic brim; *c d e*, perpendicular line; *e*, centre of gravity; *d*, centre of flotation; *b h*, horizontal line.

In the dorsal position of the woman, the back of the child would by the same process of gravity sink backward and to her right side, which would produce the right occipitoposterior position and explain why this position is the next in order of frequency before labor.

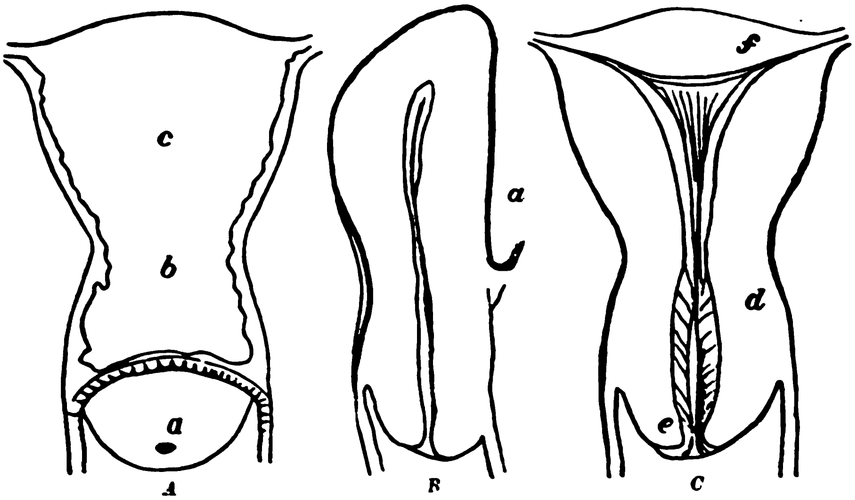
Another consideration, which may have some influence, is that by the presence of the fecal matter in the mother's intestine, the left oblique diameter of the pelvis becomes shorter than the right, which would explain the tendency of the fetal head to occupy the right oblique diameter with its long axis.

CHAPTER XXI.

CHANGES IN THE MOTHER DURING PREGNANCY.

In virgins *the uterus* (Fig. 115) measures from 2 to 2½ inches in length, in nulliparæ from 2 to 2¾ inches, and in multiparæ from 2¼ to 3 inches. In virgins and nulliparæ the body is only a trifle longer than the neck, whereas in those who have borne children it becomes from three-fifths to two-thirds of the length of the whole organ.

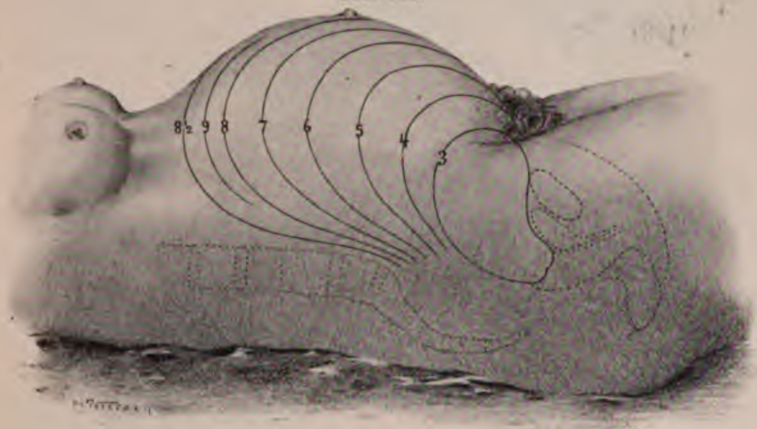
FIG. 115.



Virgin uterus. Natural size. (Sappey.) *A*, front view: the appendages and vagina are cut off: *a*, the vaginal portion of the cervix with the os externum; *b*, isthmus; *c*, body. *B*, the same in vertical mesial section: *a*, anterior surface; the letter is placed a little above the bottom of the vesico-uterine pouch. *C*, the same with cavity exposed by coronal section: *e*, os externum; *d*, os internum; *f*, fundus, the letter placed just above the uterine opening of the Fallopian tube.

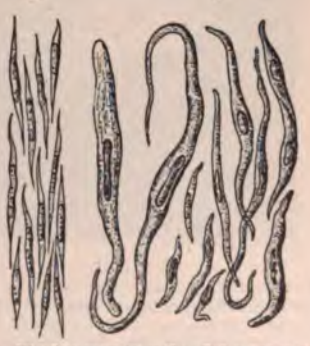
The uterus increases in size in a regular way, corresponding to the period of pregnancy. The woman should be examined lying on her back, for in the erect position the fundus sinks forward and downward. The obstetrician should mentally divide the contour of the abdomen into parts, each measuring three finger-breadths (about two and one-half inches), and he will then find the fundus at the following places at the indicated periods. At the end of the third calendar month the fundus reaches the abdominal wall above the symphysis; at the end of the fourth it stands about three finger-breadths over the symphysis; at the end of the fifth as much below the umbilicus; at the end of the sixth as much above the umbilicus; at the end of the seventh about midway between the umbilicus and the ensiform process; at the end of the eighth month it has again advanced three finger-breadths. During the first half of the ninth calendar month it rises still and enters under the edge of the ribs and approaches the ensiform process, but during the latter half it sinks again so as to come back midway between two points marking the end of the eighth month and maximum height (Fig. 116). Since these measures are only approximate, there is no necessity for using lunar months, and since our calculation of the period of pregnancy is based on nine calendar months, it is more practical to follow the same system in describing the size of the uterus. The writer has also found this method very reliable in regard to foretelling when confinement is to be expected.

FIG. 116.



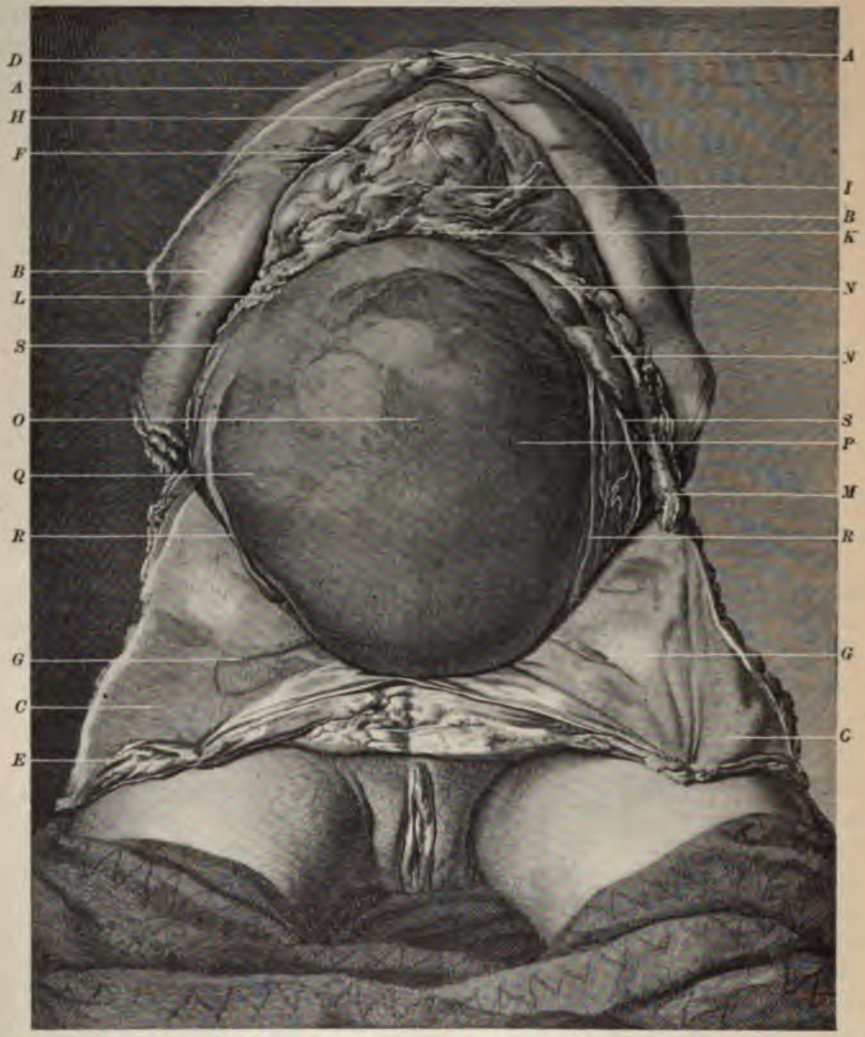
Size of uterus at the end of each calendar month of pregnancy.

FIG. 117.



Uterine muscle-cells. Enlargement about twenty. *a*, in the unimpregnated condition; *b*, during pregnancy.

Fig. 118.

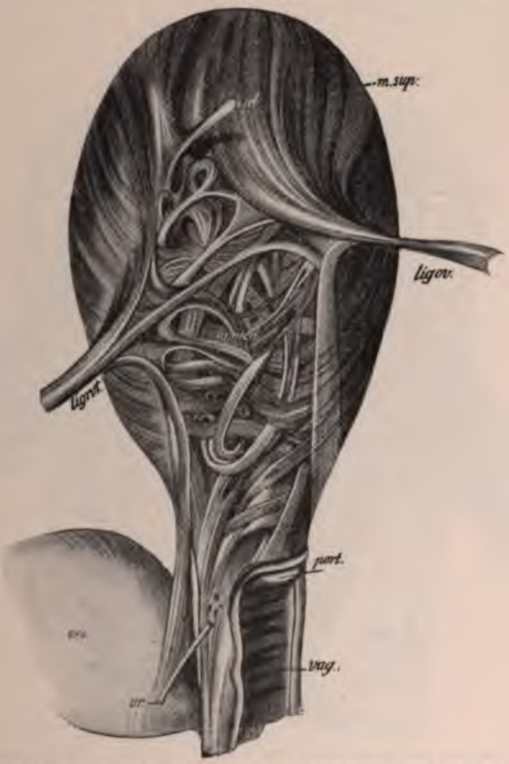


Uterus at end of pregnancy, *in situ.* (W. Hunter.) *A A*, forepart of the chest, just below the breasts; *B B*, the two upper angles of the integuments, muscles, and peritoneum, turned back over cartilaginous margin of chest; *C C*, the two inferior angles turned down; *D*, upper end of incision, at ensiform process; *E*, lower end of incision, at symphysis pubis; *F*, round ligament of the liver; *G G*, the epigastric artery and vein, shining through the peritoneum; *H*, the left lobe of the liver; *I*, the omentum, spread over the small intestine in the epigastric region; *K*, the lower and middle part of the omentum, pushed up by the womb; *L*, the omentum in the right side, passing behind that part of the uterus from which the right tube begins; *M*, the omentum, left side, which came down in front of the Fallopian tube and which was thrown aside in order that those parts might be seen; *N N*, two turns of the small intestine; *O*, the womb occupying all the umbilical and hypogastric regions; the fundus is tilted a little to the right side and the left edge is canted forward; some parts of the womb are more projecting than others, in consequence of indentations made by the intestines or of pressure exercised from within by parts of the fœtus; *P*, the middle of the placental site; *Q*, a swelling corresponding to the buttocks of the child; *R R*, the round ligaments of the uterus; *S S*, the Fallopian tubes; between the round ligament and the tube run the ovarian vessels,—the small artery and the large vein.

When the uterus reaches the *umbilicus*, this hollow becomes first flattened out to a level with the surroundings, and later it forms even a protrusion.

During the first three months of pregnancy the increase in bulk is chiefly due to a hyperplasia and hypertrophy of the muscular tissue, new muscle-cells being formed, and the old ones increasing enormously in size, so as to become from seven to eleven times longer and from two to five times wider (Fig. 117) than before. Later the increase in size of the uterus is brought about by the growth of the ovum, which expands the uterine cavity. At term the uterine wall measures only from five to ten millimetres in thickness. The chief growth takes place in the fundus. This portion of the uterus, which in the unimpregnated state forms only a slightly convex line (Fig. 115), is at the end of pregnancy elevated into a high cupola (Fig. 118). The cervix is displaced upward and backward, and the angle between

FIG. 119.



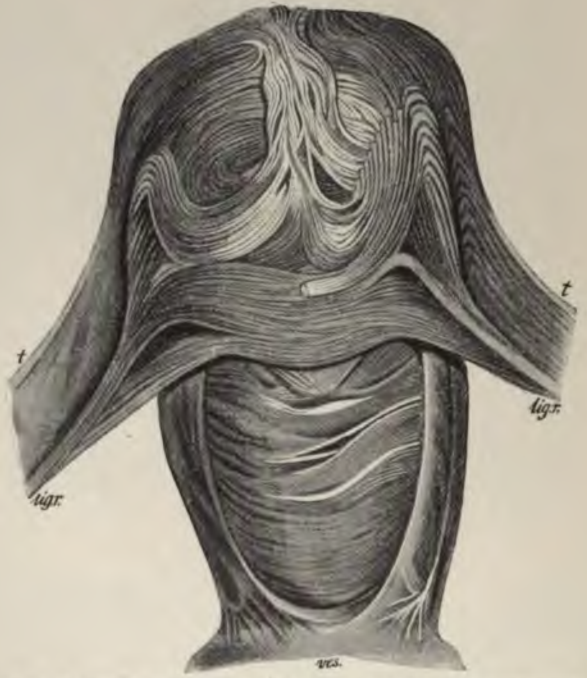
The musculature of the pregnant uterus, dissected and seen from the side. (Luschka.) *ves.*, bladder; *ur.*, ureter; *vag.*, vagina; *port.*, vaginal portion: *lig rot.*, round ligament; *lig ov.*, ovarian ligament; *tub.*, Fallopian tube; *m.sup.*, superficial muscular layer; *m.med.*, middle muscular layer.

it and the body of the womb becomes smaller, the result being a physiological anteflexion.

In the latter part of pregnancy the uterus is tilted over to the right, so that the greater part of it lies in the right side of the body, and besides, the left edge is canted forward, displacements which probably are due to the descending colon being more filled with fecal matter than the ascending.

The muscular tissue may be separated into three layers. The outer layer is thin and continuous with the musculature of the tubes, the round ligament, and the ovarian ligament. It forms a hood over the fundus, but leaves the side edges free (Figs. 119 and 120.) The innermost layer forms concentric rings around the openings of the tubes, and others encircling the uterus (Fig. 121). The middle layer is composed of bundles crossing one another in all directions, often forming bows, returning in the direction they came from, and descending between the bladder and the vagina (Figs. 119 and 120). In the lowest part of the body of the uterus—the so-called lower uterine segment—the muscle bundles are arranged in flat layers

FIG. 120.



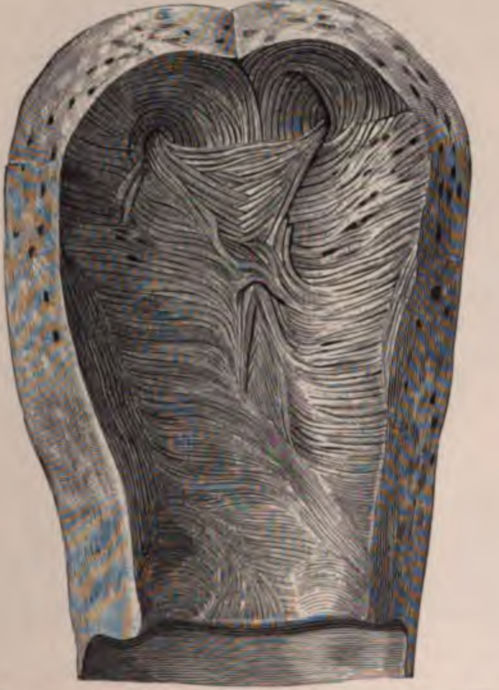
The musculature of the pregnant uterus, front view. (Hélie.) The peritoneum has been dissected off and the bladder separated from the uterus and turned down. *tt*, the Fallopian tubes; *lig.r.*, the round ligaments; *ves.*, the bladder.

which go slanting inward and downward from the peritoneal coat to the decidua. These being held together with short lamellæ extending from one to the other, there remain between them rhomboid hollows (Figs. 122, 123, 124).

The wall of the uterus becomes remarkably soft, so that even intestinal knuckles can make dents in it and prominent portions of the fœtus form protuberances on the surface (Fig. 118).

The cervix also softens and increases in length and circumference, but no new muscle tissue is formed within it. There seems to be a shortening of the cervix when it is palpated from the vagina, which is due partly to the swelling of the vaginal wall, partly to the softness of the cervix, and partly—in primiparæ—to the descent of the head into the cervical canal towards the end of pregnancy. The glands of the cervix secrete a thick mucus, which fills the cervical canal like a plug and closes the uterine cavity. (Compare Superfetation and Infection.)

FIG. 121.



The submucous muscular layer of the pregnant uterus. (Hélie.)

Not only the musculature, but all the component parts of the uterus and the neighboring organs grow. The arteries form long spirals, the veins are dilated to large flat spaces, called *sinuses* (Fig. 125).

The ovarian blood-vessels are nearly as large as the uterine (Fig. 126). The lymph-vessels are enlarged, the nerves swell, and the large cervical ganglion increases much in size (Fig. 127). The weight of the uterus, which in the virgin is about an ounce, reaches two pounds. The capacity of the cavity is five hundred and nineteen times greater.

In growing the uterus separates the two layers of the broad ligaments and lifts them up. The round ligament is enlarged. The peritoneum is lifted up from the bottom of the pelvic cavity to a level with the posterior part of the iliopectineal line.

Fig. 122. Fig. 123. Fig. 124.

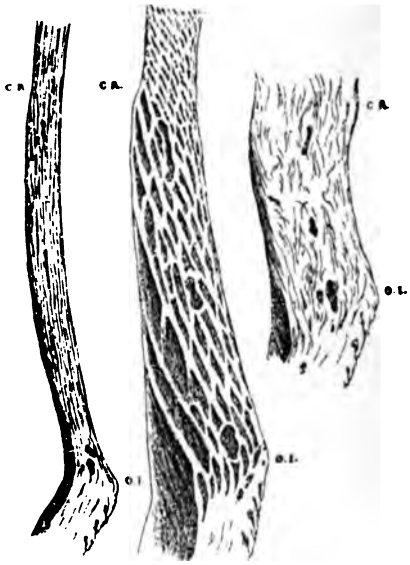


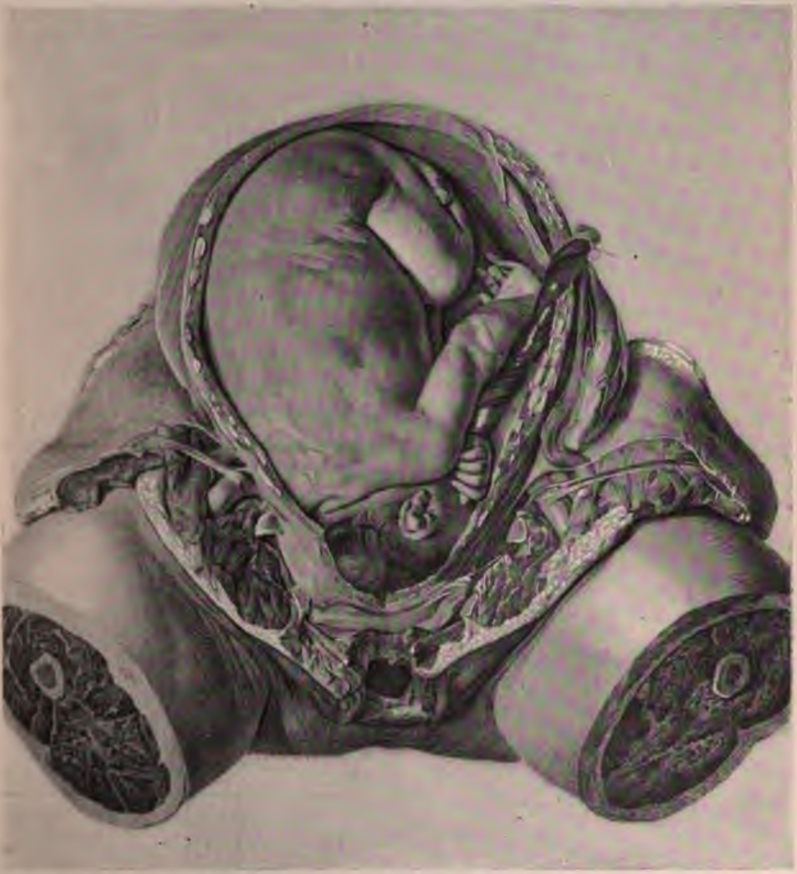
Fig. 122.—Longitudinal section through the lower segment of a pregnant uterus. (Ruge.)

Fig. 123.—The same section, in which the muscular lamellæ have been pulled apart, showing the rhomboid cavities between them.

Fig. 124.—A similar section of a puerperal uterus, showing the shortening of the musculature after birth. *O.I.*, internal os; *C.R.*, contraction ring.

The *ureter* adhering to the peritoneum follows an entirely different course from that found in the unimpregnated state. Its middle part, that which in the unimpregnated condition sinks down to the spine of the ischium, is during pregnancy lifted up to the brim of the pelvis. From the point where the ureter crosses the iliac arteries it goes forward, downward, and outward, lying immediately under the peritoneum, on the wall of the false pelvis. A little behind the ends of the transverse diameter of the brim of the pelvis it dips into the true pelvis and goes in a curved line, inward, forward, and downward, till it reaches the bladder. In this way it passes under the broad ligament, and in front of this it lies again immediately under the peritoneum. From the point where it opens into the bladder to the posterior surface of the pubes, behind the spine, is a distance of three inches. It will thus be seen that, while the posterior part of the pelvic portion of the ureter is lifted to so high a level, the anterior end retains its position (Fig. 128).

Fig. 125.



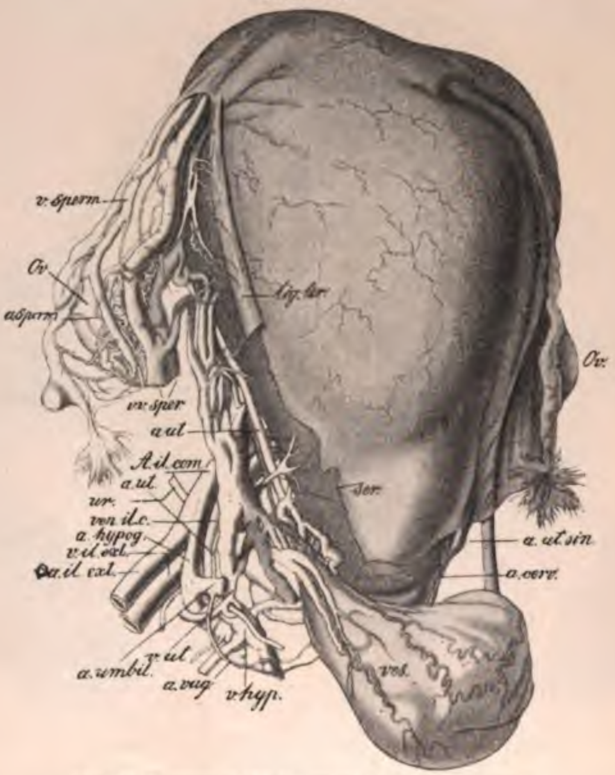
Womb with fœtus of a primipara at the end of pregnancy, vertex presentation, right occipito-anterior position. (W. Hunter.) The upper part of the bladder has been cut away in order to show the head in the lower part of the uterus. The forepart of the womb and the membranes, which included the placenta, have been removed. The cut surface of the uterine wall shows large venous sinuses injected with wax.

The *tubes* follow an almost perpendicular course on the side of the uterus (Fig. 118). Their musculature grows, they are softened, and sometimes even decidual tissue is formed in parts of their mucous membrane.

The *ovaries* are drawn up into the abdominal cavity so as to lie about midway between the level of the fundus and that of the external os (Fig. 118). As we have seen above, the one corpus luteum that corresponds to the pregnancy remains to the end, but no new ones are formed while it lasts.

The *vagina* becomes softer and larger, its anterior wall often bulging through the entrance (Fig. 129). It has a characteristic purple color. Its adipose tissue is absorbed. The *vulva* becomes darker, softer, and swollen.

FIG. 126.



The blood-vessels of the uterus at the end of pregnancy.

The *iliosacral joint* and *the symphysis pubis* become softer, larger, and allow a greater mobility, by which the passage of the fœtus through the pelvic canal is facilitated.

The *breasts* are the seat of important changes. Small glands in the areola, called *Montgomery's glands*, and similar in structure to the mammary gland, become enlarged and form a more or less complete circle around the nipple. Small pigmented tongues shoot out in the

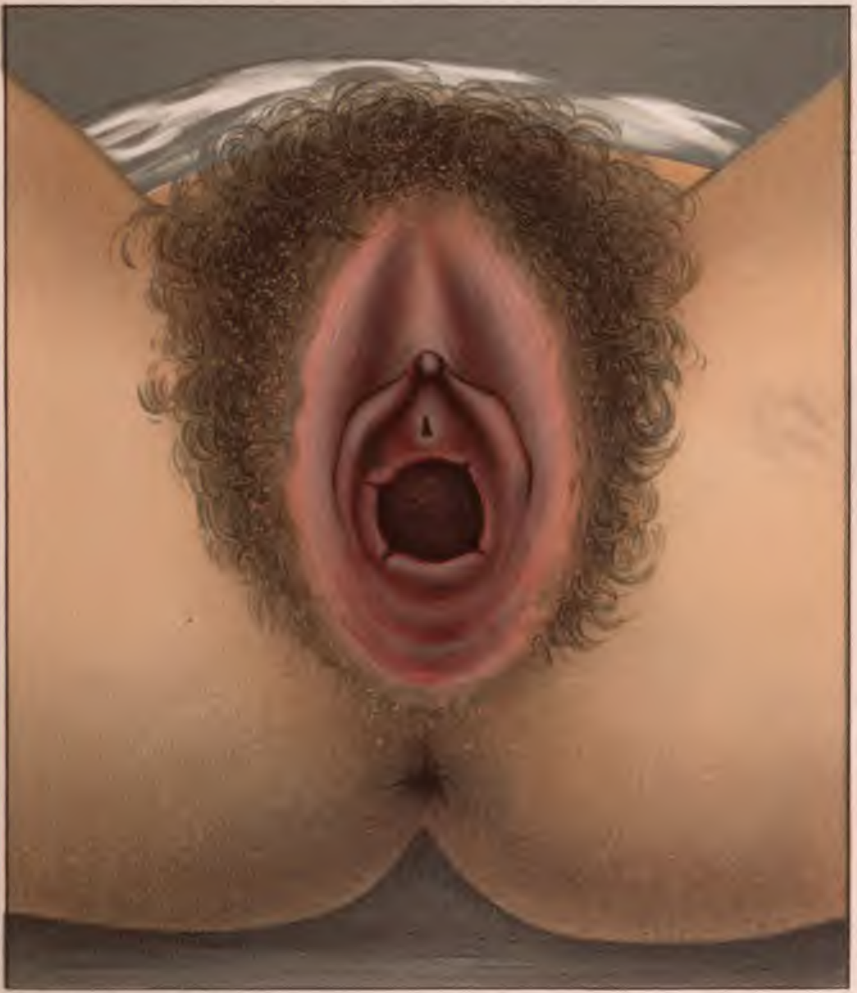
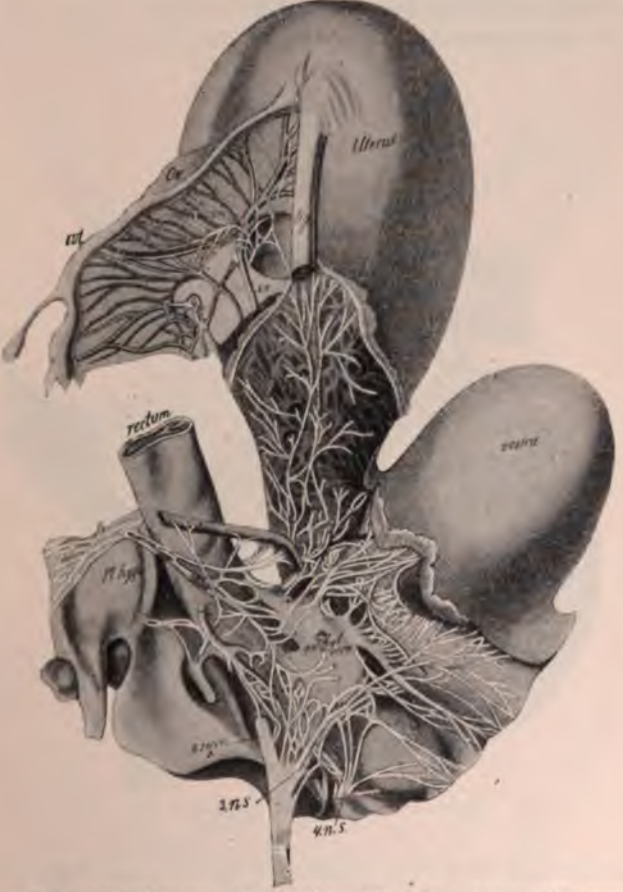


FIG. 129.—Vulva and protruding anterior wall of vagina in primigravida.

circumference of the areola, beginning upward and outward. Each two of these tongues blend by their tops, leaving a small round circle of unpigmented skin between, which by contrast with the pigmented appears as a white spot. New tongues are formed outside of the first ring until the radius of the areola becomes two or three times as long as it was before. This extension of the areola is called the *secondary areola.* Its color differs, corresponding to the color of the individual's hair and skin. In blondes it is light brown, in brunettes dark brown (Figs. 130–133). The true areola becomes swollen, the nipple more prominent and covered with small scales formed by inspissated secretion. By pressure on the breast a drop of clear fluid

FIG. 127.

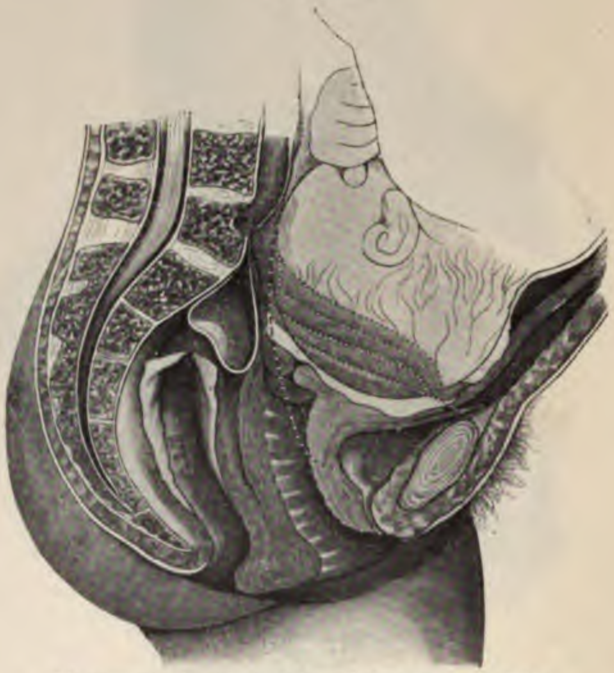


The nerves of a pregnant uterus. (Frankenhäuser.) *Pl.hyp.*, hypogastric plexus; 2 *nerv.s.*, 3 *n.s.*, 4 *n.s.*, second, third, and fourth sacral nerves; *Ov.*, ovary; *tub.*, Fallopian tube; *lig.*, round ligament; *vo*, ovarian vein.

may sometimes be made to appear on the top of the nipple. The whole breast becomes larger and heavier so that it hangs down. The veins become more visible. *Striæ*, like those on the abdomen, are often seen radiating from the areola.

The mammary gland undergoes a great development in order to prepare it for the requirements of lactation. Until the age of puberty this gland remains little developed. Each acinus is composed of a few end bulbs sprouting from a lactiferous duct (Fig. 134). But at puberty the glandular structure becomes more complicated (Fig. 135).

FIG. 128.



The course of the ureters at the end of pregnancy. (Polk.)

During pregnancy new-formed adipose tissue is interspersed between the acini. The lactiferous ducts from one lobule of the mammary gland anastomose, and form finally a single duct which perforates the nipple separately. At the base of the nipple each forms a spindle-shaped dilatation, called a *lactiferous sinus* (Fig. 136).

The woman often experiences shooting pains through the breasts. In the face, especially the forehead, appear often large brown spots, called *chloasmata uterina*. In the median line of the abdomen a similar pigmentation commonly takes place, extending as a dark line upward from the symphysis pubis to the umbilicus or even to the processus

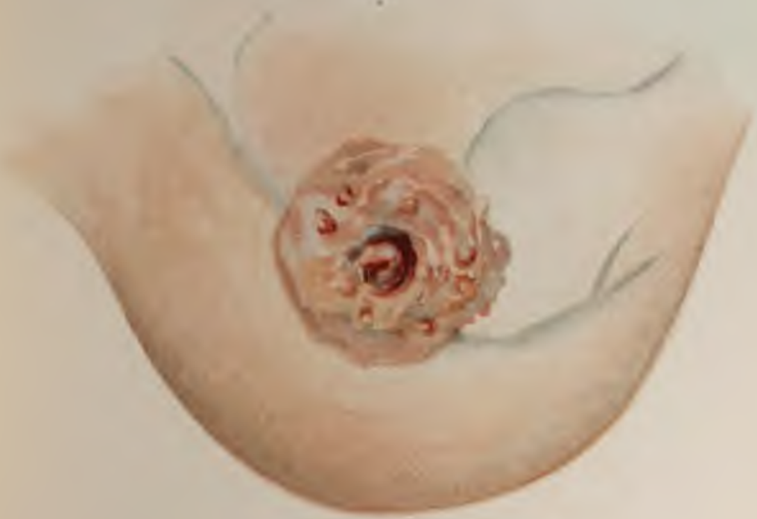


FIG. 130.—Breast of unimpregnated blonde.

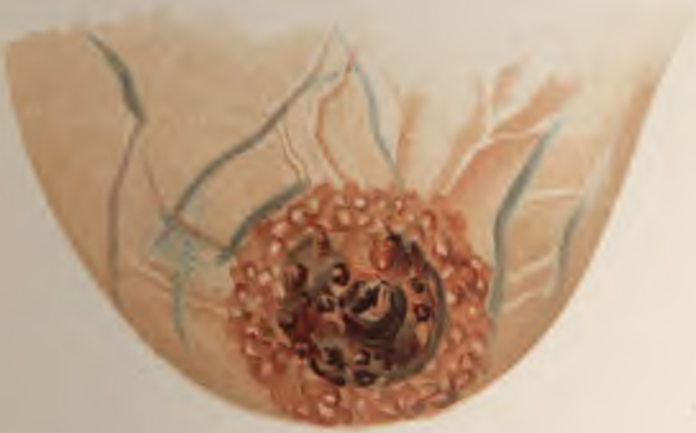


FIG. 131.—Breast of pregnant blonde.

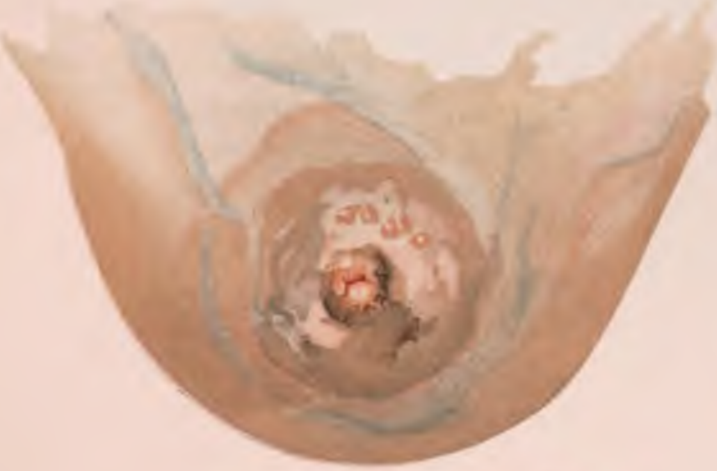


FIG. 132.—Breast of unimpregnated brunette.

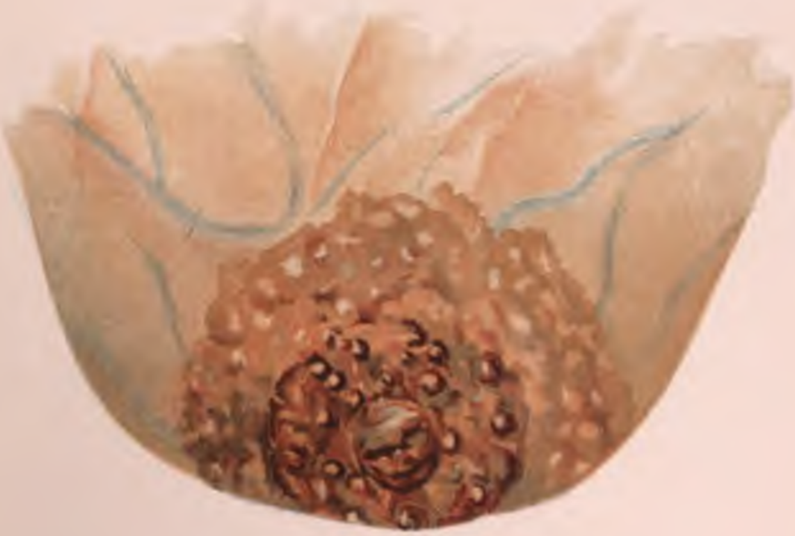
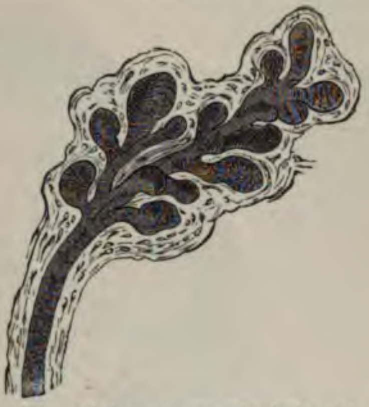


FIG. 133.—Breast of pregnant brunette.

ensiformis. As a sign of pregnancy this so-called *linea fusca* has little value. Sometimes it is missing in pregnancy; and often, especially in brunettes, it is found in unimpregnated women. Around the umbilicus it widens sometimes to a circle which has been called the *umbilical areola*.

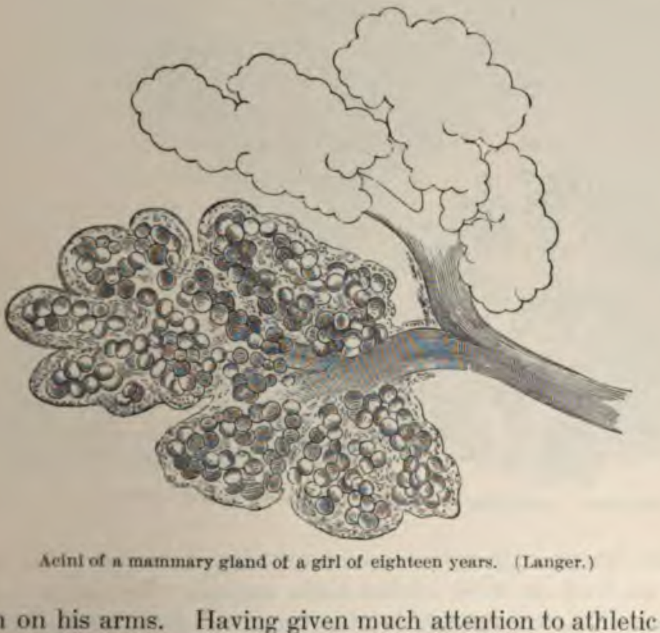
FIG. 134.



Acinus of the mammary gland of a girl sixteen years old. (Langer.)

In consequence of the great distention of the abdominal wall, the corium gives way in many places, much like an old elastic stocking. Thus the so-called *striæ* (Fig. 137) are formed. They have a purplish color. After childbirth they shrink and become white, with a silvery shining surface and fine transverse wrinkles, and are then called *striæ albicantes*. Like the linea fusca they have little value as signs of pregnancy, for they are not always formed during pregnancy and they may be due to other causes. Thus, the writer knows a man who has them on his arms. Having given much attention to athletic sport, the powerful contractions of his biceps muscles have had the same

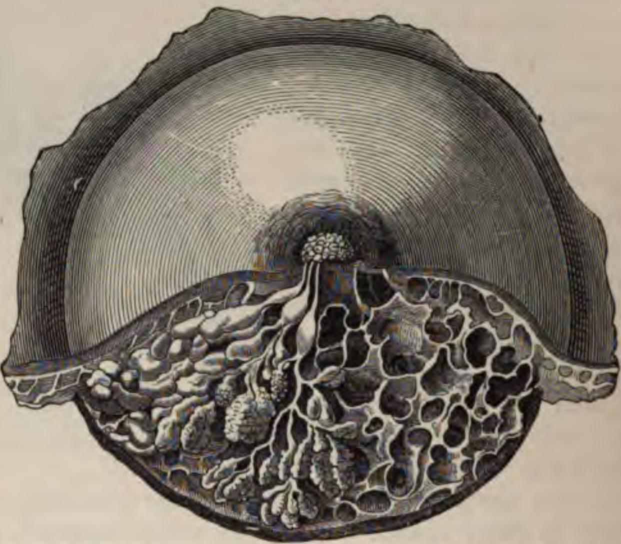
FIG. 135.



Acini of a mammary gland of a girl of eighteen years. (Langer.)

effect on the skin of his arms as the gradual distention of the uterus and mammary gland has on the skin of the abdomen and breast in pregnant women.

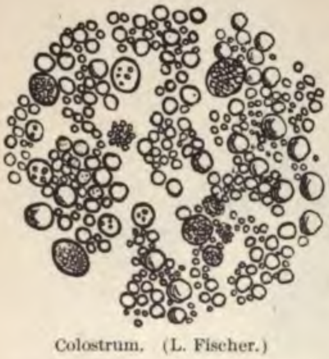
FIG. 136.



Mammary gland of a woman during lactation with lactiferous ducts and sinuses. (Luschka.)

New *adipose tissue* is formed under the skin, especially at the hips. The *centre of gravity* moves farther back. The uterus tipping forward against the anterior abdominal wall in the erect posture, the woman is obliged to carry her body backward in order not to fall. This peculiar attitude together with the mobility of the pelvic joints gives a pregnant woman a peculiar gait.

FIG. 138.



Colostrum. (L. Fischer.)

The *lungs* are pressed up by the rising fundus, but what they lose in height they gain in width, so that their capacity remains unchanged.

The dull area of the *heart* is increased, in consequence of a hypertrophy of the left ventricle, which has an increase of work to perform.

The intestine and the omentum are pushed upward and to the sides (Fig. 118).

The lower extremities commonly become *œdematous* and their veins, as well as those of the labia majora, often show *varicosities*, changes which are referable to the pressure of the uterus on the large venous trunks in the pelvis and the abdomen.

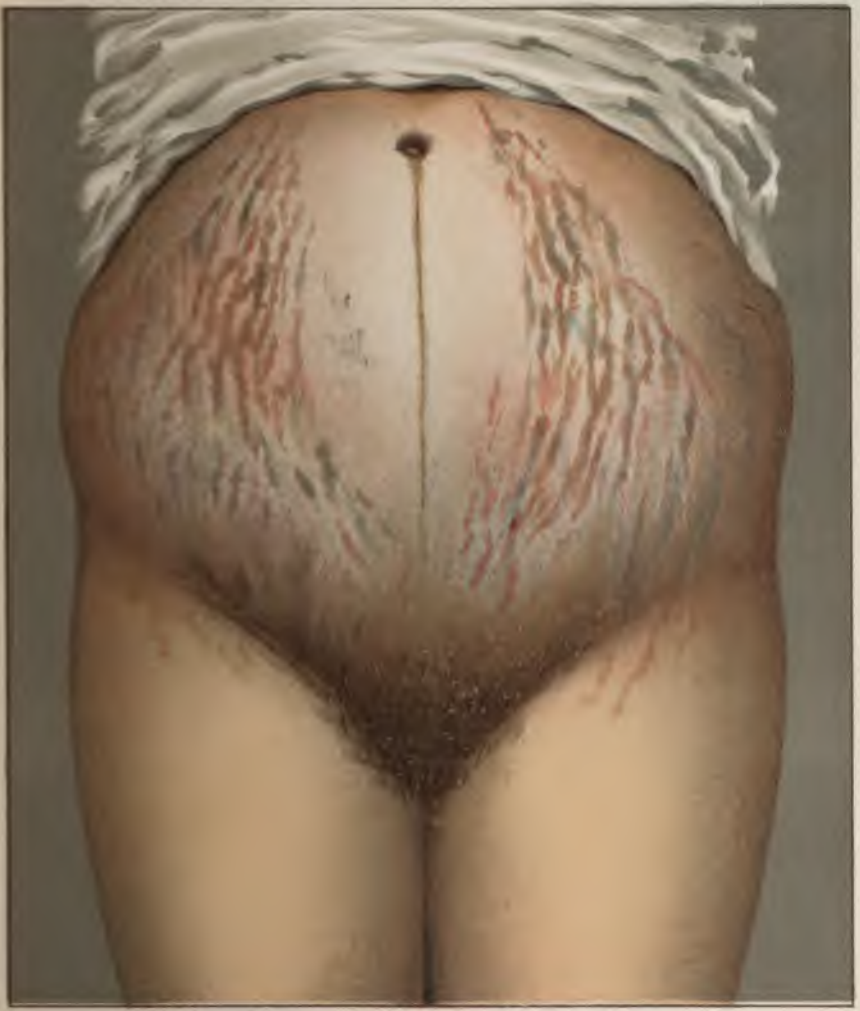


Fig. 137.—Abdominal striæ.

On the inside of the cranium, especially on the parietal and frontal bones, flat *osteophytes* are frequently formed.

In the beginning of pregnancy frequent micturition is a common symptom; later there may, on the contrary, be retention of urine, the urethra becoming compressed. The urine sometimes contains sugar and not unfrequently small amounts of albumin, but such glycosuria and albuminuria are on the border-line of a pathological condition. Constipation is quite common. The vaginal and vulvar secretion is increased, and some degree of leucorrhœa is frequent. Sometimes the secretion of saliva is increased. In the breasts is formed a secretion called *colostrum* (Fig. 138). Examined under the microscope it shows *colostrum-corpuscles*, large globular cells containing fat-globules. During pregnancy it is a colorless serous fluid, but after the birth of the child it has a yellow color, is richer in albuminoids than milk, and has an aperient effect on the child.

The *thyroid gland* also swells during pregnancy, but returns later to its normal dimensions, unless the patient suffers from goitre.

Menstruation ceases. Sometimes there may once or twice be a recurrence, but then the amount of blood lost is much smaller than usual.

The composition of the *blood* changes. The total quantity is increased, and it contains more water, fibrin, and white blood-corpuscles and less hæmoglobin.

The *nervous system* is in a state of excitement. Often the woman complains of headache, backache, toothache, or pleurodynia. Often she has a pronounced desire for certain things,—so-called *longings*,—or a marked aversion for others. The mental condition varies much according to circumstances. Thanks to antiseptic midwifery the times are no longer when a woman knew she ran a considerable risk of her life in giving birth to a child. Still, from childhood she has been taught, "In sorrow thou shalt bring forth children." Married primiparæ are, however, as a rule, happy at the thought that they are destined to go through the last stage of physiological development characteristic of their sex; that they shall call one of these sweet little babies, whom by instinct all women love, their own, and that it will be a new tie between them and their husbands. How different is the position of the poor unmarried girl who feels that she is going to be a mother! Her social position is lost, perhaps she is disowned and cursed by her nearest relatives, and perhaps poverty stares her in the face. No wonder, then, that she is apt to be downcast, melancholy, full of apprehension, a condition of mind that has a decided bearing on the prognosis in regard to mortality and morbidity in childbirth. Finally, we have the married multipara who has already found it hard to make both ends meet, and who deplores an addition to

On the inside of the cranium, especially on the parietal and frontal bones, flat *osteophytes* are frequently formed.

In the beginning of pregnancy frequent micturition is a common symptom; later there may, on the contrary, be retention of urine, the urethra becoming compressed. The urine sometimes contains sugar and not unfrequently small amounts of albumin, but such glycosuria and albuminuria are on the border-line of a pathological condition. Constipation is quite common. The vaginal and vulvar secretion is increased, and some degree of leucorrhœa is frequent. Sometimes the secretion of saliva is increased. In the breasts is formed a secretion called *colostrum* (Fig. 138). Examined under the microscope it shows *colostrum-corpuscles*, large globular cells containing fat-globules. During pregnancy it is a colorless serous fluid, but after the birth of the child it has a yellow color, is richer in albuminoids than milk, and has an aperient effect on the child.

The *thyroid gland* also swells during pregnancy, but returns later to its normal dimensions, unless the patient suffers from goitre.

Menstruation ceases. Sometimes there may once or twice be a recurrence, but then the amount of blood lost is much smaller than usual.

The composition of the *blood* changes. The total quantity is increased, and it contains more water, fibrin, and white blood-corpuscles and less hæmoglobin.

The *nervous system* is in a state of excitement. Often the woman complains of headache, backache, toothache, or pleurodynia. Often she has a pronounced desire for certain things,—so-called *longings*,—or a marked aversion for others. The mental condition varies much according to circumstances. Thanks to antiseptic midwifery the times are no longer when a woman knew she ran a considerable risk of her life in giving birth to a child. Still, from childhood she has been taught, "In sorrow thou shalt bring forth children." Married primiparæ are, however, as a rule, happy at the thought that they are destined to go through the last stage of physiological development characteristic of their sex; that they shall call one of these sweet little babies, whom by instinct all women love, their own, and that it will be a new tie between them and their husbands. How different is the position of the poor unmarried girl who feels that she is going to be a mother! Her social position is lost, perhaps she is disowned and cursed by her nearest relatives, and perhaps poverty stares her in the face. No wonder, then, that she is apt to be downcast, melancholy, full of apprehension, a condition of mind that has a decided bearing on the prognosis in regard to mortality and morbidity in childbirth. Finally, we have the married multipara who has already found it hard to make both ends meet, and who deplores an addition to her family. Upon the whole, most women approach their confinement with a serious turn of mind, which in some amounts to apprehension and dread, sometimes mixed with despair. The humblest woman who is going to give birth to a child should, therefore, inspire her accoucheur with genuine sympathy. His knowledge and skill, however great they may be, do not suffice; he must feel with his patient, pity her sufferings, think of her dangers, forgive her sins, comfort and encourage her, and not forget that she is going to give birth to a human being, perhaps one of Nature's favorites, maybe one who will become a benefactor of mankind. The French proverb is right: "*Femme enceinte, femme sainte*" (a pregnant woman is a holy woman).

CHAPTER XXII.

THE UTERUS AT THE END OF PREGNANCY.

Sections through the median line of frozen bodies of women who died at the end of pregnancy or during labor have afforded a valuable complement to the classical work of William Hunter, "The Anatomy of the Human Gravid Uterus," of which we have reproduced two plates above (Figs. 118, uterus at term *in situ*, and 125, uterus and fœtus at the end of pregnancy). In Fig. 108 we have given a reproduction of one of these sections in a case of pelvic presentation. Fig. 139 shows a vertex presentation in a case of narrow pelvis.

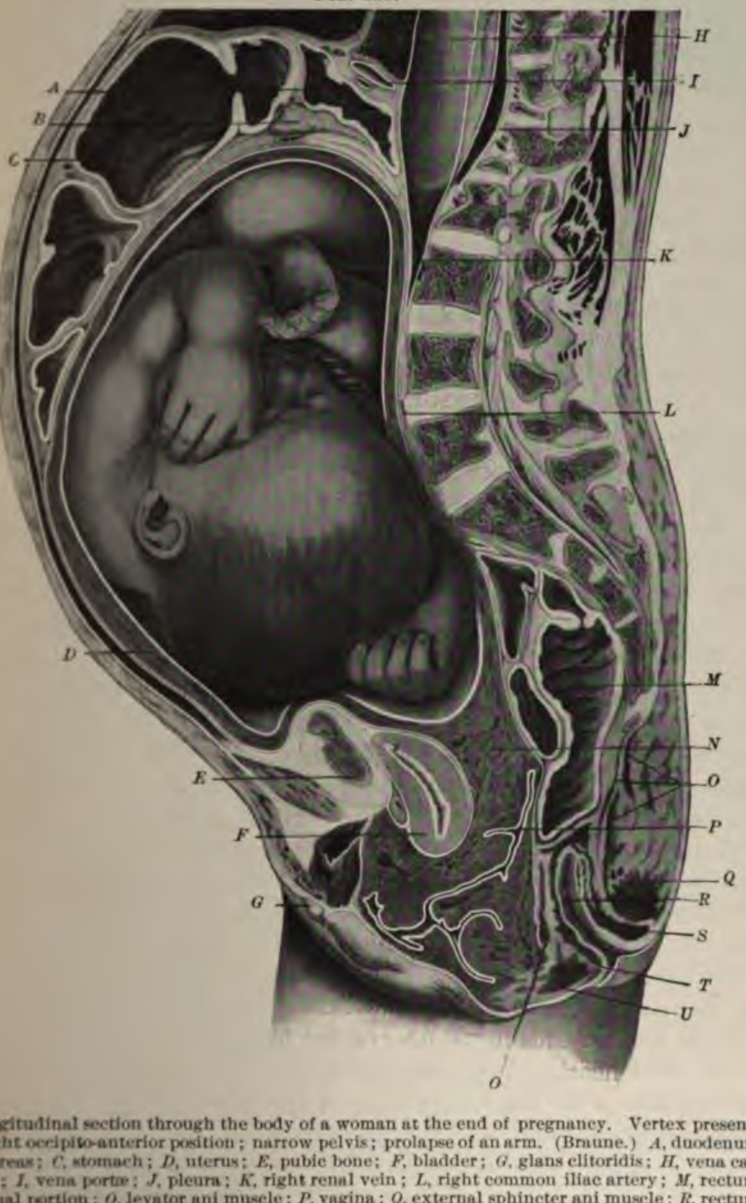
In the dorsal position of the woman and when there is no muscular contraction, the uterus rests on the spinal column, and on account of its softness it moulds itself on it to some extent. The intestine and the liver press on it from above, and prominent portions of the fœtus make it bulge out. As a whole it forms a lengthy, irregular bag. The cut surface of the uterine wall shows the large, flat venous sinuses.

The fundus is on a level with the second lumbar vertebra or even the cartilage between it and the first. In primiparæ the resistance of the abdominal wall brings it nearer to the vertebral column; in multiparæ the fundus sinks more forward and downward to the umbilicus. Compared with the condition found in the third and fourth months the wall is thin, quite exceptionally reaching one centimetre (seven-sixteenths of an inch) in some places.

During the last few weeks of pregnancy the lower part of the body of the uterus widens. In pluriparæ the cervical canal retains its full length (from 1¼ to 1½ inches), while in primiparæ the upper part of it is expanded and merges in the cavity of the body.

In pluriparæ the uterus remains above the pelvic brim; in primiparæ it is pushed deep down into the pelvis by the pressure from above.

FIG. 139.



Longitudinal section through the body of a woman at the end of pregnancy. Vertex presentation, right occipito-anterior position; narrow pelvis; prolapse of an arm. (Braune.) *A*, duodenum; *B*, pancreas; *C*, stomach; *D*, uterus; *E*, pubic bone; *F*, bladder; *G*, glans clitoridis; *H*, vena cava inferior; *I*, vena portæ; *J*, pleura; *K*, right renal vein; *L*, right common iliac artery; *M*, rectum; *N*, vaginal portion; *O*, levator ani muscle; *P*, vagina; *Q*, external sphincter ani muscle; *R*, rectum; *S*, internal sphincter ani muscle; *T*, internal sphincter ani muscle; *U*, external sphincter ani muscle.

During nearly the whole period of pregnancy the uterus contracts from time to time. These contractions may help to prevent stagnation of blood in the uterine veins. They are also instrumental in determining the presentation of the fœtus, and towards the end of pregnancy they serve to expand the lower uterine segment and open up the upper part of the cervical canal in primiparæ. They are, as a rule, not perceived by the pregnant woman and are not accompanied by pain, if the organs are in a healthy condition.

CHAPTER XXIII.

SIGNS OF PREGNANCY.

All the changes in the mother described above are, of course, signs of pregnancy, but since many of them are common in other conditions and some are hardly available, it is of practical importance, even at the risk of seeming to repeat what has already been said, to pass these changes in review from the stand-point of their value in guiding the physician in determining the question frequently put to him, whether a woman is pregnant or not.

There are only very few sure signs of pregnancy—a single one of which suffices for a diagnosis,—namely, to hear the fetal heart or the sound sometimes produced in the umbilical cord, to feel, see, or hear the movements of the fœtus, to feel parts of the fetal body, and to feel uterine contractions.

The fetal heart sound is a double sound produced by the contraction of the auricles and ventricles of the fetal heart. It may be heard from about the middle of pregnancy. It is in most cases easily distinguished from that of the mother by being about twice as frequent and of smaller volume; but if the maternal pulse beats rapidly the frequency alone would not suffice to recognize the fetal heart sound, since what we hear might be the maternal heart sounds weakened by being heard at so great a distance. Any doubt in this respect is, however, easily cleared up by following the sound up to the region where the maternal heart is situated, when we find the sounds gradually increasing in strength. In most cases the distinction is also easily made by holding the index-finger on the mother's wrist while we listen to the fetal heart. Any pulsation due to the maternal circulation is synchronous with the contraction of the ventricles of the maternal heart and radial pulse, and the accompanying sound is single. The character of the sound is peculiar. It has been likened to the ticking of a watch, and this gives also a good idea of the double sound; but on the other hand, the fetal heart has not the hard metallic ring perceived by applying a watch to the ear. The fetal heart sound is heard on the anterior wall of the abdomen, which for the purpose, with due regard to cleanliness and decency, should be covered with a thin cloth, for instance a fine pocket-handkerchief, unless a stethoscope is used. In the most common presentation and position of the fœtus—the left occipito-anterior position in the vertex presentation—the sound is heard most distinctly about two inches below and to the left of the umbilicus, being transmitted in the shortest line from the heart through the back of the child to the abdominal wall. But often it may be heard over a large area. In the right occipito-anterior position, the sound is often heard most distinctly farther out to the side, being conducted through the thorax of the fœtus. In pelvic presentations the heart sound is heard a little above the umbilicus. Thus the situation of the place where the sound is perceived most distinctly gives even some information as to the presentation and the position of the fœtus. Furthermore the frequency of the fetal heart contractions sometimes gives at least a hint in regard to the sex of the fœtus. The nearer the contractions come to 120 per minute, the surer the fœtus is a male, and the nearer they come to 144, the greater is the likelihood that it is a female; but most frequently it is 132 or thereabout, which does not allow the accoucheur even to make an intelligent guess. In the writer's experience the frequency of the heart sound is a pretty reliable guide in foretelling the sex, if the frequency is either decidedly slow or rapid.

The heart sound varies much in frequency in consequence of the condition of the fœtus. The mere presence of a stethoscope increases its frequency. It becomes also more frequent in febrile diseases of the mother. On the other hand, it becomes much slower towards the end of fetal life, and may thus furnish indications for the intervention of the accoucheur. When the fœtus dies, the heart sound stops altogether, but the mere fact that it cannot be heard signifies by no means that the fœtus is dead. The silence may be due to a change of position or other circumstances. One day the sound may not be audible, and the next we hear it again.

The *umbilical-cord sound* is a single or double blowing sound synchronous with the first fetal heart sound. It is rather rare, and is probably due to compression or tension of the cord. In some cases in which this sound is audible the cord may be felt through the anterior abdominal wall crossing over the back of the fœtus.

The sounds produced by the *fetal movements* are very characteristic. Sometimes the sound denotes a soft, sliding movement, and at other times it is like a smart slap against the ear applied to the abdominal wall or against the end of the stethoscope. Such sounds may be heard as early as the end of the third month of pregnancy. They are mostly produced by movements of the extremities of the fœtus, but some are attributed to hiccough. We can also feel these movements when we place the hand on the abdomen; and often they are so marked that they are easily seen.

A practised hand can in most cases of advanced pregnancy easily distinguish characteristic *parts of the fœtus*,—the round hard head, the long cylindrical back, the roundish but softer breech, the large and long thighs, the hard and pointed knees, and beyond them the shorter and thinner legs and feet.

From the time the pregnant uterus reaches the abdominal wall we may by seizing it with the hand and holding it, feel it harden in consequence of muscular *contraction*. If the phenomenon does not appear readily, it is well to dip the hand in ice-cold water before applying it to the uterus. No tumor or swelling of any other kind possessing the power of contraction, it is an absolutely sure sign of pregnancy, and may be perceived even after the death of the fœtus.

The diagnosis of pregnancy is most difficult in the beginning, nearly all the certain signs being limited to the second half of pregnancy. The first sign to appear is the *cessation of menstruation*. If in a woman who has always had her courses regularly and who has been exposed to become impregnated the menstrual flow does not appear at the time it is expected, there is *prima facie* great probability that she is pregnant; but the sign is far from reliable. The suppression of the menses may be due to exposure to wind and weather, a refrigeration of the feet, anæmia, tuberculosis, or other diseased conditions. After an abortion, or after the inside of the womb has been curetted, or after a severe hæmatemesis, sometimes several months pass before the period is re-established. It is not rare that in newly married women, in consequence of the excitement of the new relations, menstruation is interrupted. It happens also in unmarried women who have had sexual intercourse and dread the consequences.

Impregnation may take place in women who have never menstruated, either because they have not reached puberty, or because that function never becomes established in them. It occurs also frequently during that suppression of the menses which is due to lactation.

If to the absence of menstruation are added nausea and vomiting, the probability increases. The so-called *morning sickness*—nausea experienced before breakfast—is particularly suspicious. If a woman vomits and can eat a meal immediately thereafter, disease of the stomach and functional disturbance of the intestinal tract due to other causes may be excluded, and there is the greatest likelihood of her being pregnant. The morning sickness is probably sympathetic, brought about by pressure on the uterine nerves by the expansion of the womb.

Among the objective signs, the two earliest in the writer's experience are the above described changes in the breasts and the softening of the lower uterine segment. By means of the development of Montgomery's glands and small brown tongues shooting out from the outer and upper circumference of the areola, he has often recognized the existence of pregnancy in primiparæ as early as six weeks since the beginning of the last menstruation. In women who have borne children this sign is of much less value, and at all events it develops later.

About the same time appears another sign of great value,—the *softening of the lower uterine segment*, after its discoverer called *Hegar's sign*. It is not necessary, as recommended, to carry this test to such extremes as to compress the whole lower uterine segment between the hard cervix and the upper part of the body of the uterus, which manipulation is probably not without danger to the woman. All that is needed is to feel just above the cervix, near the median line, a point not larger than the tip of the finger, where the tissue is so soft that the finger sinks in as if pressed into butter. If the uterus is retroflexed, the soft point is felt on the corresponding part of the posterior surface.

Braun-Fernwald's Sign.—Another early sign of pregnancy that often is present is a difference in the shape of the two lateral halves of the uterus, the side where the ovum is situated being thicker in an anteroposterior direction. On the anterior surface is commonly found a vertical groove separating the two unequal parts.

The presence of a *fluid in the breasts* is less reliable than the pigmentation of the skin and the development of Montgomery's glands. It has been found accompanying uterine and ovarian tumors, and the writer has seen it in a virgin, following the injection into the uterine cavity of diluted liquor ferri chloridi for hemorrhage produced by a fibroid. On the other hand, the cessation of milk secretion during lactation is often a sign denoting that a new pregnancy has commenced. The *change of color of the vagina* is also often observed at an early date of pregnancy.

The increase in the size of the womb is likewise characteristic. First the anteroposterior diameter lengthens, so that the uterine body becomes more globular in contradistinction to the cylindrical cervix. Next the uterus becomes broader, its edges moving nearer to the walls of the pelvis. Last of all the height is increased. At the same time that the body is enlarged, we feel it more anteflexed, often resting close on the whole anterior wall of the vagina.

Softening of the cervix, if well developed, has some value as a sign of pregnancy. The cervix of the unimpregnated uterus feels like the tip of the nose; that of the impregnated, like the lips of the mouth.

But œdema, especially of the anterior lip, is not rare in gynæcological patients outside of pregnancy. In the lower part of the side edges, especially on the left side, is heard a single blowing sound like the one we hear on the side of the neck of chlorotic women. It is called the *uterine souffle* or *bruit*. From its locality we may conclude that it is produced in the large uterine vessels. It is synchronous with the maternal pulse. It can be heard from the time the uterus rises into the abdominal cavity to the end of pregnancy, and is not affected by the death of the fœtus. Since a similar sound may be produced by uterine or ovarian tumors, it is not a reliable sign of pregnancy, but taken together with other early signs it has its value as corroborative evidence.

The enlargement and softness of the *vagina* with increase of the secretion of that organ deserve consideration. The sensation of pulsation in the vaginal roof is quite common outside of pregnancy.

The *linea fusca* is of little importance. In some pregnant women it is little developed; and, especially in brunettes, it may be found in virgins, extending even to the ensiform process.

Purple-colored striæ may denote pregnancy, but may also be produced by tumors distending the abdominal wall.

Ballottement is by some regarded as a certain sign of pregnancy. The word is taken in two different meanings. In the wider acceptation it means the perception of the displacement of a thin fluid in palpating the fœtus through the abdominal wall. In the narrower sense it applies to vaginal examination. The woman is placed in a half-sitting posture. One or two fingers are introduced to the roof of the vagina, and the uterus is steadied by the other hand. By suddenly pushing the vaginal finger upward, we displace the whole fœtus, which floats up in the liquor amnii and shortly thereafter sinks down again on the tip of the examining fingers. This may be observed between the fourth and the seventh month. Before that time the fœtus is too freely movable to sink down, and later it is too large to be displaced. Ballottement is a valuable sign of pregnancy, but subserous fibrous tumors of the uterus or a cancerous tumor of the omentum, accompanied by ascites, may give a sensation resembling it pretty closely.

Sometimes distinct *fluctuation* can be made out by a bimanual examination similar to that just described, even at an earlier date than ballottement, indeed from the end of the second month.

Fetal movements felt by the mother are of little value, as they often appear so late that the certain signs are already developed, and often are supposed to be felt by women who wish or dread to be pregnant, although they are not in that condition. Still more worthless are, of course, all sorts of pains and aches, longings and other mental changes. The first perception of fetal movement by the mother—the so-called *quickening*—occurs most frequently about the middle of pregnancy, but while some women experience the sensation at the end of three months, others do not have it before two-thirds of the time is gone. The character of the movements also varies much. While they sometimes cause a rather pleasant sensation, at other times they may be so strong as to be inconvenient or even painful and disturb the woman's sleep.

Some women assert that they can feel when conception takes place. What they feel is probably the entrance of seminal fluid into the uterus, but insemination, as we have seen above, does not necessarily lead to impregnation.

CHAPTER XXIV.

DIFFERENTIAL DIAGNOSIS OF PREGNANCY.

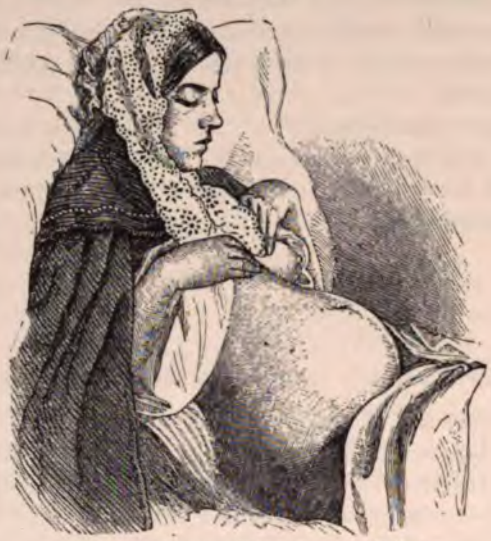
In early pregnancy the enlargement of the uterus may be due to *subinvolution* after the previous pregnancy or to *chronic metritis*. As a rule, however, there will in these cases be a history of suffering which does not correspond to pregnancy. There may be a *congestion*, especially when the uterus is retroflexed, a displacement that is apt to interfere with the free circulation in that organ. If menstruation continues, pregnancy may be excluded. *Myoma* of the uterus may be taken for pregnancy, but this disease is not accompanied by cessation of menstruation, and often it causes, on the contrary, menorrhagia or metrorrhagia,—*i.e.*, hemorrhages at the time of the menstrual period or in the interval between the regular discharges. The cervix is apt to be merged with the corpus at a much earlier date than in the pregnant uterus.

Most commonly an *ovarian cyst* is taken for pregnancy or *vice versa*, but ovarian cysts have not that regular development which is so characteristic of pregnancy. As a rule, menstruation continues. The tumor develops in one side, and not in the middle, as does the pregnant uterus. Ovarian cysts, as a rule, cause pain, especially the dermoid variety. They show much more distinct fluctuation. Presence of contraction decides that the swelling is the pregnant uterus. By anæsthetizing the patient and pulling the cervix down with a volsella, the whole unenlarged uterus may be palpated with two fingers in the rectum (Hegar's method).

Ascites is due to some disease, especially of the heart, the liver, or the kidney. The abdomen is much flatter and softer. The dull percussion area changes according to the position, the fluid gravitating to the lower parts of the abdominal cavity. Fluctuation is exceedingly distinct.

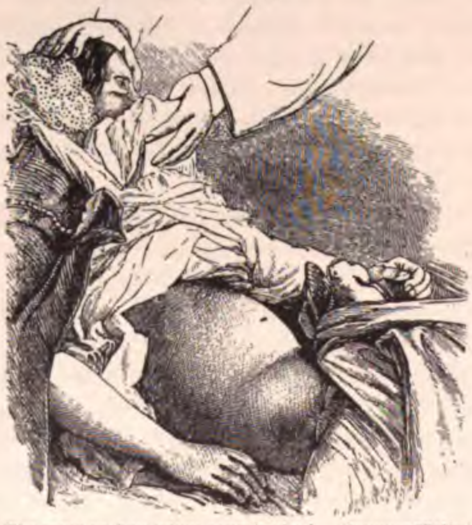
If there is a transverse partition closing the vagina or the cervix, the *menstrual blood accumulates*, forming a uterine tumor which might be mistaken for the pregnant uterus; but in these cases there are painful molimina at the time the fluid should appear. The cervix disappears sooner than in pregnancy, while, on the other hand, the body grows much more slowly.

FIG. 140.



Hysterical tympanites. (Spencer Wells.)

FIG. 141.



The same patient when anæsthetized. (Spencer Wells.)

Simple development of *adipose tissue* is often taken for pregnancy, although these conditions are easily differentiated by the history of the case and by the absence of all signs of pregnancy except the large abdomen. By bimanual examination, if not from the vagina, then from the rectum, the small uterus is felt.

When pregnancy is *combined* with ascites or a uterine or an ovarian tumor, one of the two may easily be overlooked if the obstetrician does not think of the possibility of the complication, and even if he does so the diagnosis may be difficult; but by careful examination, if necessary under anæsthesia, the condition will be cleared up.

Pseudocyesis, or *spurious pregnancy*, is a curious imitation of pregnancy found in nervous or hysterical women who are anxious to have offspring, either in the beginning of married life or at the approach of the menopause. Menstruation ceases, the abdomen increases in size (Fig. 140), a tumor can be felt, percussion may even be dull on account of contraction of the abdominal muscles, the areolæ change, and the patient believes that she feels fetal movements. In due time labor pains set in. The patient, her friends, and sometimes her physician, too, think she is pregnant or even in labor. Specialists have been sent for to perform embryotomy or Cæsarean section. And still it is all only a simulacrum of pregnancy brought about by the working of the mind on the nervous system. Accurate physical examination will show the absence of all the certain signs of pregnancy, and if the patient is anæsthetized, the distended abdomen flattens out and the unimpregnated uterus may be palpated (Fig. 141). When the patient recovers consciousness the apparent swelling is reproduced. A similar condition is said to be found in domestic animals. In the case from which the figures are taken which accompany the description no suspicion of pregnancy was entertained, but the patient and her friends thought she had an ovarian tumor. In cases of *supravaginal hypertrophy of the cervix* the obstetrician should be particularly on his guard not to overlook a complication with pregnancy. The cervix, being as long as the whole normal uterus and sometimes thickened, is taken for the entire organ. The error is best avoided by following the lateral edges of the cervix upward till they join the corpus.

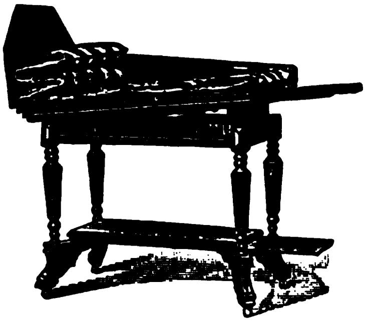
CHAPTER XXV.

PHYSICAL EXAMINATION.

In making a physical examination of an obstetrical case we employ inspection, external palpation, percussion, auscultation, vaginal examination, and rarely a speculum.

If the examination is made in the physician's office or a dispensary before labor has begun, it is best to place the patient on one of the usual gynæcological examination-tables,—for instance, Daggett's (Fig. 142). She should beforehand loosen all bands around her waist and remove her corset. If she has closed drawers, she should slip off one side of them. If they are open, it is enough to push them down to the symphysis pubis. She should be placed in dorsal position (Fig. 143), on a thin horse-hair mattress covering the level table, and with a cushion under her head. The heels of her shoes should be placed in the openings in the extensions serving as stirrups. She should at first be covered with a sheet up to the waist, but when the examination begins, the sheet is pushed down to the symphysis together with the drawers, and her chemise and undervest should be pushed up towards the breasts so as to expose the whole abdomen to view. By inspection we notice the size and shape of the abdomen, and if the size is unusual, we take the measure of the circumference of the body on a level with the umbilicus with a tape measure. We look for linea fusca and striæ, purple and white, the condition of the umbilicus, and fetal movements.

FIG. 142.



Daggett's examination-table.

Next we proceed to the *palpation* of the abdomen. Most authors recommend that this be done with the hands laid flat on the abdomen and the fingers turned up to the chest of the woman. The writer finds, however, that we have a much finer perception by turning the tips of the fingers against the object we wish to feel, and he places himself, therefore, at the right side of the patient and turns the fingers downward against the fundus uteri (Fig. 144) or transversely over the abdomen in palpating the body of the fœtus (Fig. 145).

The consistency of the uterus is tense and elastic, but there is felt through the abdominal wall no fluctuation, unless there is an abnormal quantity of liquor amnii. The fundus is found at the places indicated above according to the stage of the pregnancy. The greater part of the uterus is lying in one side, usually the right, the fundus is tipped to the right, the left edge canted forward, which is felt by means of the round ligaments, the left being nearer the median line than the right, which latter sometimes is not accessible to the touch.

The shape of the uterus differs in a first pregnancy from that found in the following ones, being ovoid in the former and more globular in the latter; but even then the longitudinal axis is longer than the transverse. If, on the contrary, the latter exceeds the former, we

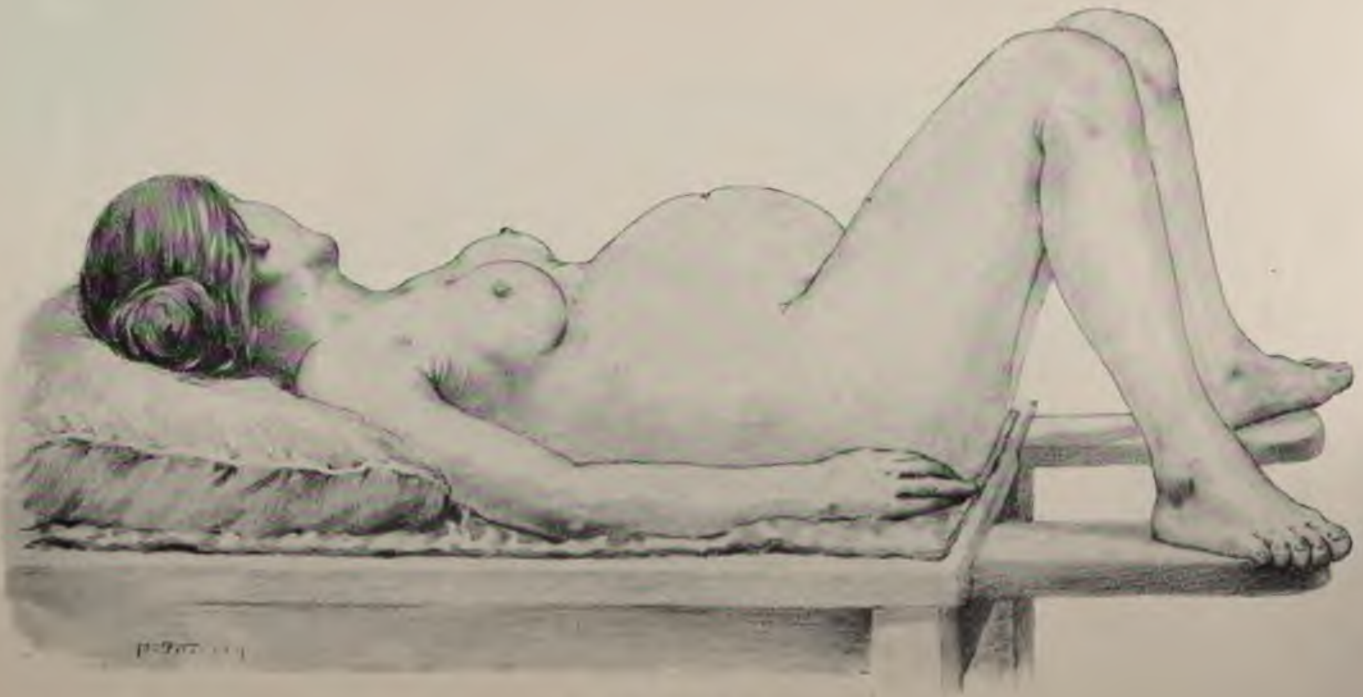
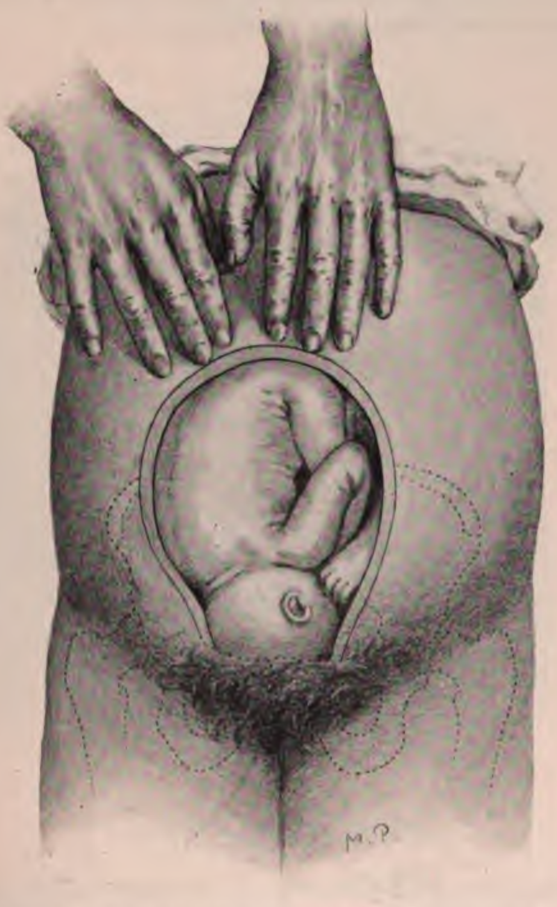


FIG. 143.—Dorsal position.

conclude that this is a case of transverse presentation. We notice if in a first pregnancy the head remains above the brim, which would mean a mechanical disproportion between the head and the pelvis. In pluriparæ we see if the fundus hangs forward and downward, a condition known as pendulous abdomen.

FIG. 144.

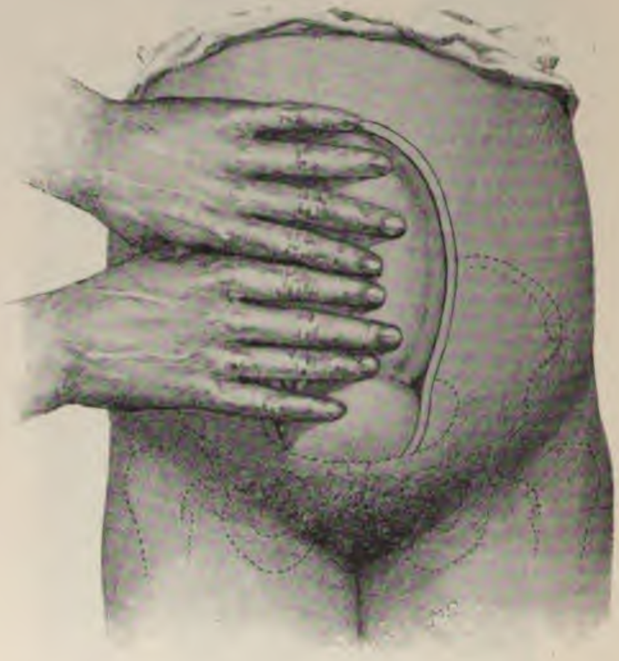


Palpation of the fundus uteri in the middle of the seventh month.

After having finished our examination of the uterus, we palpate the fœtus. The head is most easily recognized as a large, hard, round body. It may be felt between the two hands pressed down in either iliac fossa (Fig. 146), or it may be grasped either from above or from below with one hand (Figs. 147, 148). At the opposite end the breech is felt, somewhat similar, but smaller, less regular, and softer.

Between the two we feel the long cylindrical back, and between it and the head the neck as a narrower part upon which the fingers can be pressed in. Going out from the breech it is easy to map out the thighs. What is left—namely, legs and arms—is called the *small parts*, which cannot be distinguished from one another by themselves, but sometimes they may be so by their connection with the larger parts of the fetal body. If the head is neither felt at the symphysis nor at the fundus, we feel for it in the sides, and if we feel it there we know that we have to deal with a cross presentation.

FIG. 145.



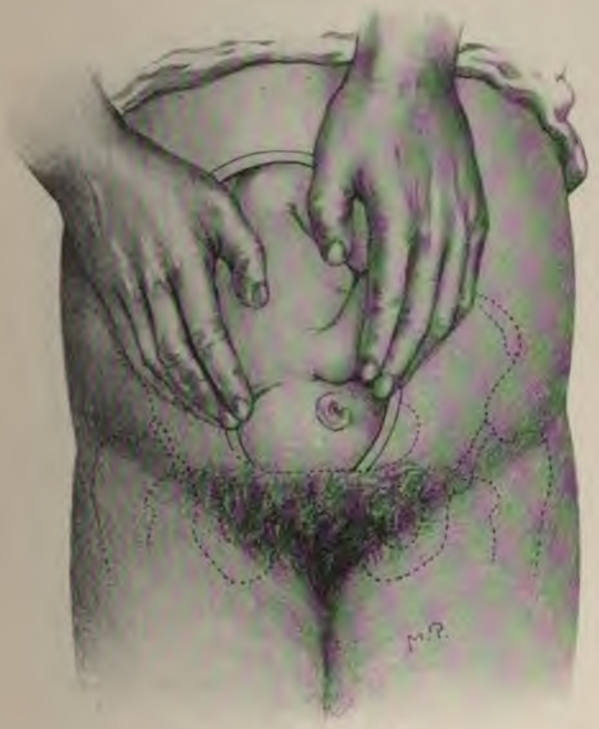
Palpation of the back of the fœtus.

If the back is not felt distinctly, its palpation may be facilitated by pressing on the fundus, which bends the back and makes it more prominent.

By suddenly pushing the hands down under the presenting part, this may be made to yield, the fœtus mounting in the liquor amnii and sinking back again—ballottement. If the head is engaged in the true pelvis, only part of it is accessible to touch.

It is not only the presentation that can be made out through the abdominal wall, but to some extent even the position. The fingers can be introduced deeper on the side where the more pointed occiput lies than on that occupied by the broader forehead (Fig. 146). If we feel the small parts very distinctly and over a large area, we may conclude that they lie against the anterior wall, and that consequently the occiput is turned backward (Fig. 149). In palpating the abdomen we pay attention to movements of the fœtus, which are particularly well marked there where the small parts are situated.

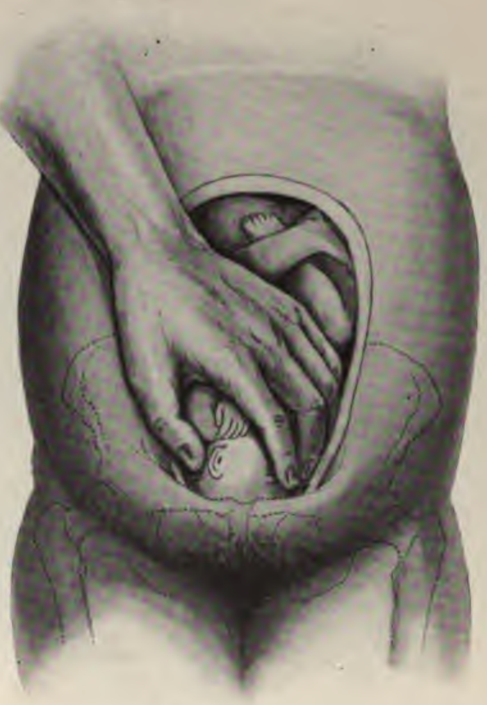
FIG. 146.



Palpation of head with both hands.

Percussion gives a flat tone. *Auscultation* forms an important part of the obstetric examination. Sometimes we hear best with a stethoscope and in other cases with the ear applied to a thin cloth covering the abdomen; but the latter method is applicable only to that part of the abdomen which is driven well forward by the enlarged uterus, since the hollow formed between the abdomen and the thighs precludes a proper adaptation of the ear. A binaural stethoscope is much preferable to a single. It presses less on the abdomen; the physician can reach all parts of the abdomen without changing his position; and the stethoscope conducts a larger volume of sound, which, when the sound to be heard is weak, is an advantage. The sounds become much more distinct if we extend the patient's legs or, still better, let them hang down, for in these positions the legs are not in our way and the uterus is brought in closer contact with the anterior abdominal wall. We listen for *heart sounds*, *umbilical-cord sound*, *uterine bruit*, and *fetal movements*. The left occipito-anterior position being the most common, the *heart sound* is, as a rule, heard most distinctly about two inches below and to the left of the umbilicus, and, therefore, we apply the stethoscope first to this place; but whether we hear it there or not, we extend our examination in all directions, and satisfy ourselves where the sound is most distinct. The diagnostic value of the different places in which this maximum distinctness is found, the character of the sound, and its frequency have been discussed above in describing the signs of pregnancy.

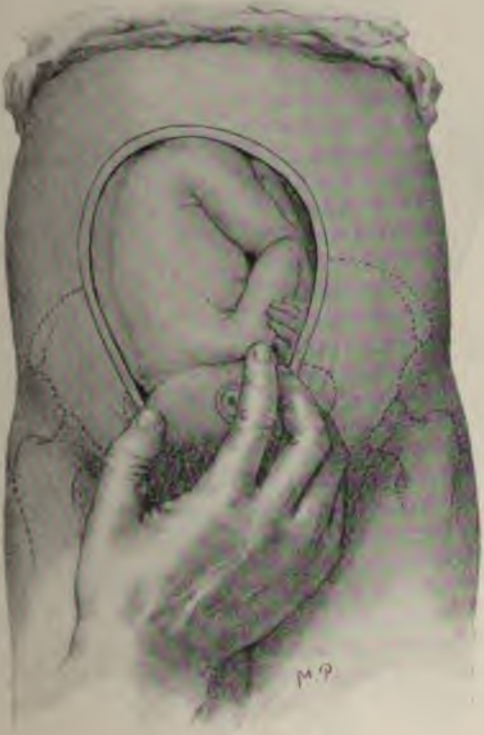
FIG. 147.



Grasping head with left hand from above.

The *umbilical-cord sound* is, as we have said, rather rare. It is usually single and synchronous with the first heart sound, but it may also be double. It is, as a rule, heard at some distance from the place of maximum intensity of the heart sound. If the sound is single, it is sometimes produced by compression of the cord between the back of the fœtus and the anterior abdominal wall, of which we have a proof in the fact that we sometimes can produce it at will by pressure with the stethoscope. In other cases it seems to be due to the increased tension of the cord when it is wound around the neck or an extremity, or simply has an unusually large number of turns. The production of the double sound has been attributed to an unusual development of the valves found both in the umbilical arteries and veins. These different sources of the sound would also explain why in some cases it is fugitive and in others permanent.

FIG. 148.

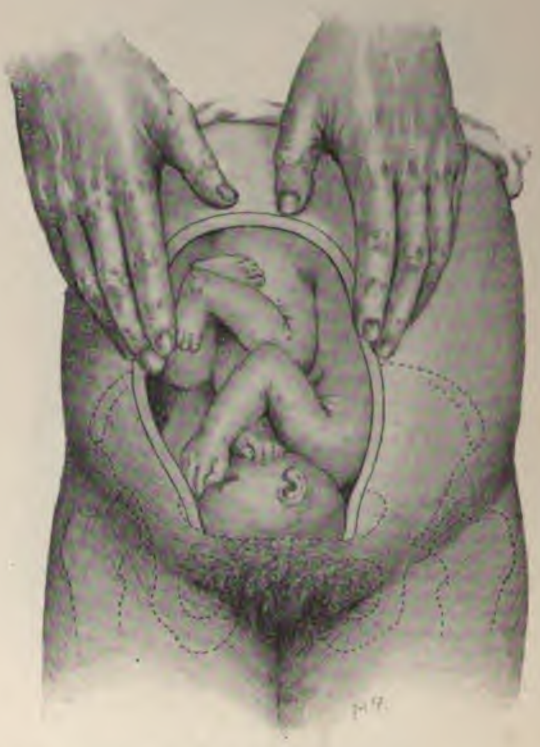


Grasping head with right hand from below.

The *uterine souffle* or *bruit* has been described above as among the uncertain signs of pregnancy, and the *fetal movement* as one of the certain signs. Besides the sounds mentioned, the examiner hears the pulsation in the mother's aorta, and sometimes wind shifting place in the intestine.

For the *vaginal examination* the feet are again brought up to their former position. During the greater part of pregnancy disinfection of the obstetrician's hands, unless they have been contaminated, is not called for; and often we do not know that we have to deal with a case of pregnancy. In most cases the woman continues her marital relations, and the parts of the husband that come in contact with her are certainly not disinfected. Hence common cleanliness as for any gynæcological examination suffices. At the end of pregnancy and during labor, on the other hand, there would be danger of infection, and therefore the most scrupulous disinfection should be instituted,

FIG. 149.



The small parts of the fœtus turned against the anterior abdominal wall. Left occipito-posterior position.

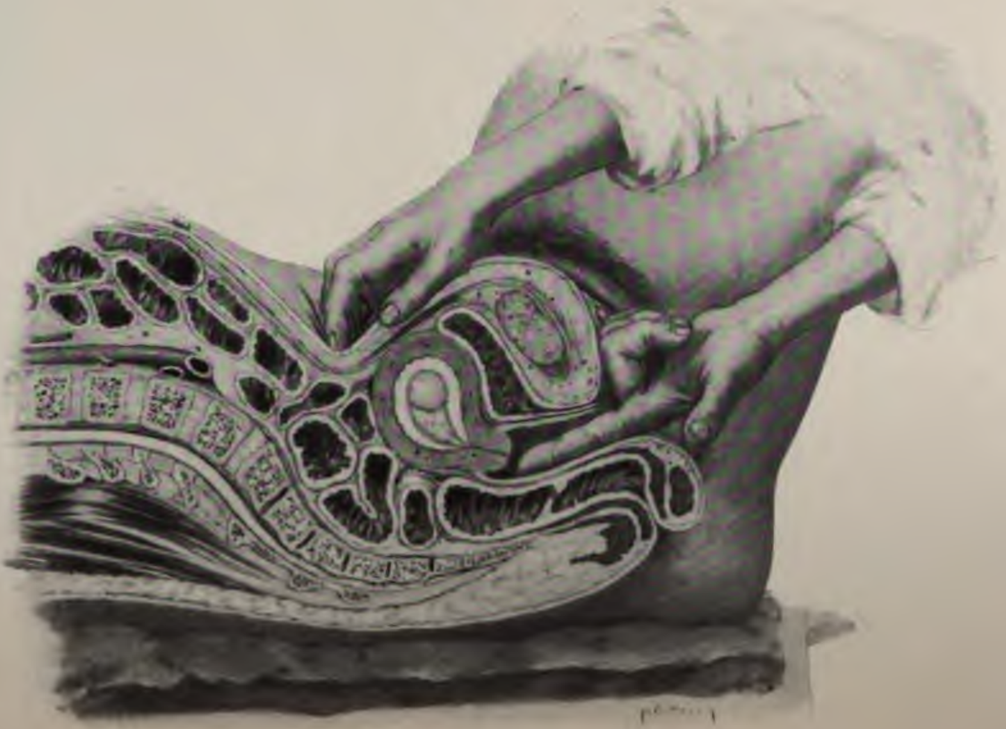


FIG. 150.—Bimanual examination.

as will be described when we come to the rules for the conduct of normal labor.

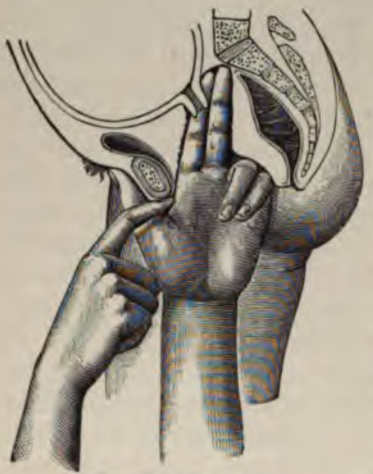
In early pregnancy, while the uterus is still totally or largely in the pelvis, a *bimanual examination* is required. The obstetrician stands now at the end of the table. In most cases it suffices to introduce the index-finger into the vagina. It should be made slippery by being dipped in a one per cent. solution of lysol or in sterilized olive oil or glycerin. The three other fingers are bent flat against the hand, so that one right angle is formed at the joints between the metacarpus and the first phalanges, and another between the first and second row of phalanges. The index-finger, again, forms a right angle with the first phalanx of the middle finger, and the thumb is extended so as to form a right angle with the metacarpal bone of the index-finger (Fig. 150). If there is room enough, it is sometimes well to introduce both the index and the middle finger into the vagina, which allows us to penetrate fully an inch deeper. In entering we ascertain by palpation or eyesight the condition of the perineum and the hymen. We notice if there be any narrowness, adhesions, or bands in the vagina. Next we examine the place and condition of the os, especially tears from former deliveries, and the length and consistency of the cervix. The writer takes it to be best, as a rule, not to enter the cervical canal, as by so doing we might carry microbes into it from the vagina.

While examining the uterus the four fingers of the other hand are placed on the fundus, which they steady and press down. By holding the uterus between the fingers of both hands we judge of its position, shape, and size.

If the vagina is spacious enough, we carry the examining fingers all over the pelvic walls and as much of the brim as we can reach, paying full attention to any irregularity or abnormal protuberances. We also test the mobility of the os coccygis. We notice if the head is engaged in the pelvis or rests above the brim. We can also get a fairly accurate impression of its size by placing a finger on it in the vagina and simultaneously seizing it above the symphysis between the thumb and index of the other hand.

Pelvimetry.—If the examination arouses some suspicion in regard to the proportions of the pelvis and the head of the child, it is well at this stage to measure the pelvis. While we are making the examination of the pelvis, we apply the middle finger accompanied by the index-finger to the middle of the promontory, press the radial side of the metacarpal bone of the index-finger tightly against the lower end of the symphysis pubis, and mark with the nail of the other index-finger how far the fingers enter the vagina (Fig. 151). Next the fingers are withdrawn from the vagina and the distance from the mark on the hand to the tip of the middle finger is measured with a tape measure. If the promontory is reached easily, that is in itself a proof that the distance is less than it ought to be,—about 5 inches (thirteen centimetres).

Fig. 151.

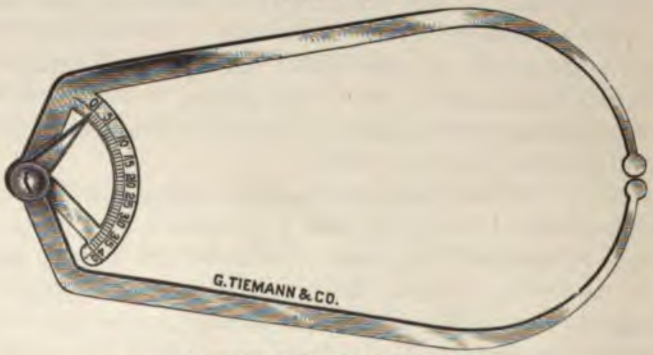


Internal pelvimetry.

To complete our measurements of the pelvis, we take with special calipers (Fig. 152) the distance between the two anterior superior spines—normally about 10 inches (twenty-six centimetres), and that between the two most divergent points of the crest of the ilium—normally about 11½ inches (twenty-nine centimetres). In taking these measures the tops of the calipers are placed just outside of a little prominence which is felt at the anterior superior spine and against the outermost point of the crest.

Finally, the woman is turned over on her left side with moderately bent knees. One end of the calipers is placed on a little depression found just under the spinous process of the fifth lumbar vertebra. In fat women this point may not be seen or easily felt, but one can always feel the posterior superior spines of the ilium. If we unite them with a transverse line, the depression between the last lumbar vertebra and the sacrum is found about a quarter of an inch above the middle of the line.

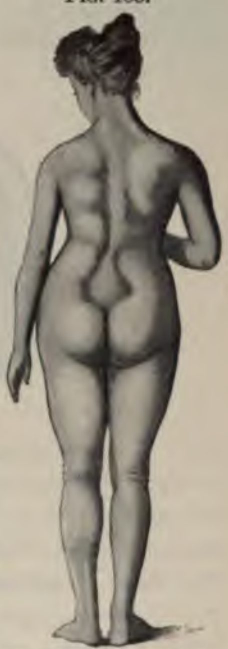
Fig. 152.



Philander A. Harris's pelvimeter.

In women who are not too fat a rhomboid figure is visible at the lower end of the spine,—*rhomb of Michaelis* (Fig. 153). The upper end is found at the depression between the fifth lumbar vertebra and the sacrum. The lower end is situated where the glutæi maximi muscles separate, near the tip of the coccyx, and the outer angles form dimples slightly above the superior posterior spines of the ilium. In well-built women this figure forms a regular parallelogram, but in those with a deformed pelvis it becomes irregular, the upper end sinking too far down.

FIG. 153.

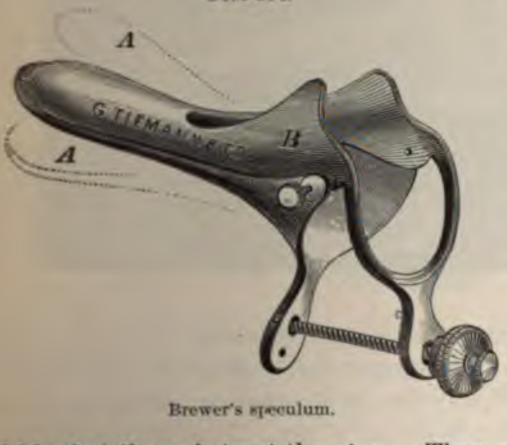


The rhomb of Michaelis.

The anterior end of the calipers is placed at the upper end of the symphysis pubis, taking good care not to press it in above, which would give too short a distance, nor to let it slide down on the anterior wall of the symphysis, which would simulate too long a distance. This measurement is called the *diameter of Beaudelocque*, and measures normally 8 inches (twenty centimetres).

A *rectal examination* is rarely needed in obstetrical cases. If it is wanted, the rectum should be emptied by the administration of a soap-suds enema. The patient may be in either the dorsal or preferably the left lateral position. The examination is usually made with the index-finger alone, in exceptional cases with the index and middle finger together, but then the patient should be anæsthetized. The space under the finger-nail should be filled with soap, in order that it may be easily cleaned after the examination. The examining finger is made slippery by dipping it in oil or smearing it with vaseline or some other greasy substance. It is best to stand behind the patient and introduce the right index-finger, which easily reaches the superior sphincter.

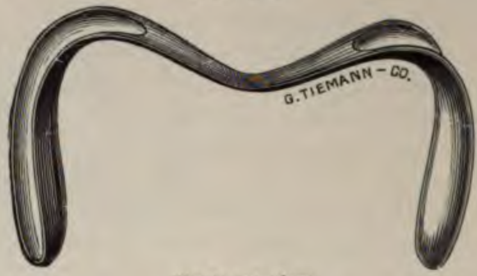
FIG. 154.



Brewer's speculum.

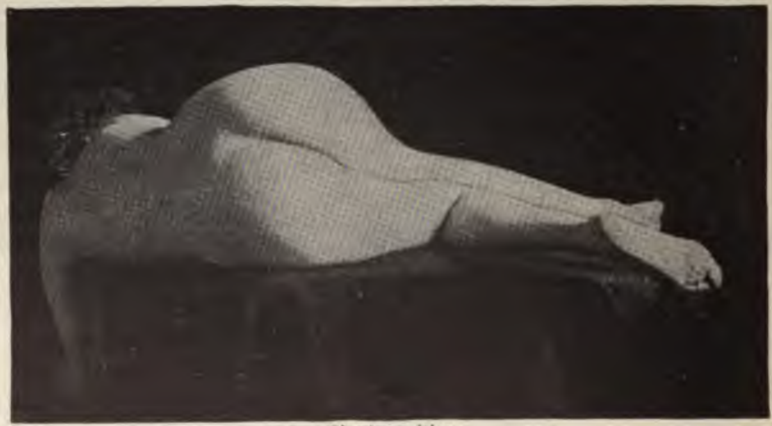
Rarely an inspection with *speculum* is called for. When it is so, we may in the beginning of pregnancy use a bivalve speculum, such as Brewer's (Fig. 154). Later, when the vagina is much softened, there are such large folds that they obstruct the view. Then a large Sims speculum (Fig. 155) is needed, and probably a depressor to hold the anterior wall out of the way. Sims's speculum is used with the patient in Sims's position (Fig. 156). The patient lies on her left side, half turned over on her front. The left side of the face rests on a cushion, the left breast touches the couch, the left arm is placed behind the body, and if the table is narrow both arms hang down at the sides of the table, but if it is too broad for that the right arm may be placed in front of the face; the nates form an inclined plane, the right being a little nearer the head and in front of the left; the right leg lies on the left, but is drawn a little higher up towards the pelvis. In order to introduce Sims's speculum the shaft is held with the left hand, and the thumb and index-finger of the right are placed along the blade to be introduced, the tip of the index-finger overlapping the end of the speculum and opening the way for it by pushing aside the labia majora and vaginal folds (Fig. 157).

FIG. 155.



Sims's speculum.

FIG. 156.

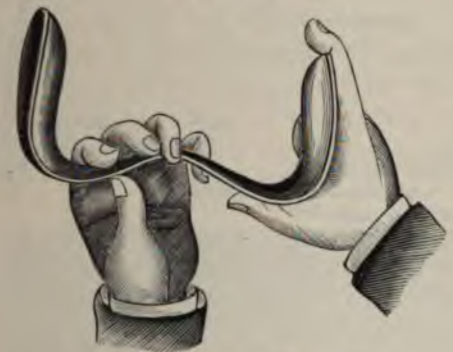


Sims's position.

Hunter's depressor (Fig. 158) is a double spoon made of flexible silver-plated copper. It is held with the right hand, while the left holds the speculum.

Garrigues's depressor (Fig. 159) is made of steel and is held with the same hand as the one holding the speculum. Sims's speculum being in place, the depressor is inserted with the right hand and its distal loop placed in front of the cervix, and then the depressor is seized with the left hand. The proximal loop, serving as handle, is held against the middle portion of a double Sims speculum (Fig. 160). The arch in the middle allows free insight into the vagina, and the obstetrician retains the free use of his right hand.

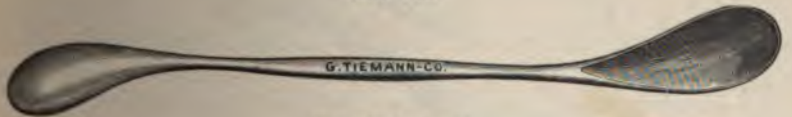
FIG. 157.



Introduction of Sims's speculum.

In inspecting the *breasts* all the features described above in treating of the changes which take place in them during pregnancy—the development of Montgomery's glands, the formation of the secondary areola, the swelling of the true areola, the increase in size of the breasts, the enlarged veins running over them, striæ, scales on the nipples, the presence of fluid in the mammary glands—should be noticed; and besides, if the mother is to nurse the child, the examiner should pay attention to the shape of the nipple.

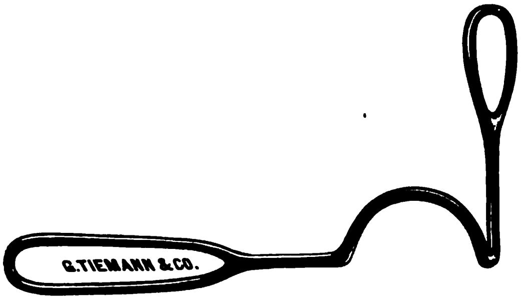
FIG. 158.



Hunter's depressor.

In cases of suspected pregnancy it is best to begin the whole examination with the inspection of the breast, which can easily be done by proposing a physical examination of the chest with the stethoscope. If then our suspicion is corroborated by what we find by the mammary examination, it is much easier to demand permission to institute a vaginal examination than if we began with a request the necessity of which would not be comprehensible to the patient or her friends.

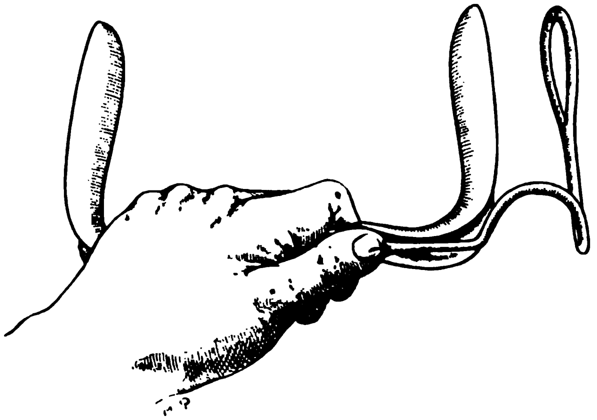
Fig. 159.



Garrigues's depressor.

If the abdominal and vaginal examinations are made in the patient's house or in another place where there is no examining-table, it is best to let the patient lie in bed and to place a board—for instance, one of those lap-boards so commonly found in private houses—under her buttocks, in order to prevent her from sinking into the soft bedding. Under these circumstances the physician takes a seat at the side of the bed and conducts the examination as far as possible under cover of a sheet, while blankets and quilts are thrown aside.

Fig. 160.



How to hold Garrigues's depressor with speculum.

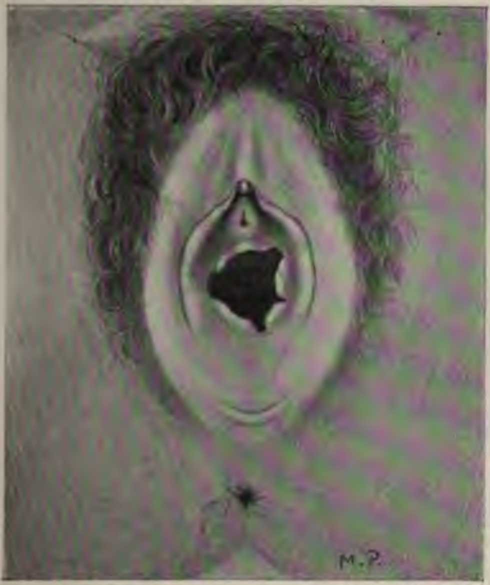
CHAPTER XXVI.

DIAGNOSIS BETWEEN THE FIRST AND LATER PREGNANCIES.

SOMETIMES the obstetrician, as a medical expert, is asked whether a woman is in her first pregnancy or has borne one or more children. As a rule, the decision is easy, but in rare cases even experienced men may be in doubt.

In the chapter treating of copulation we have seen that, as a rule, the hymen tears in one or more places by the penetration of the male organ, but as long as no birth or miscarriage has taken place there is no loss of substance, and the base of the hymen still forms an unbroken ring (Fig. 29, p. 21). The passage of a child, on the other hand, causes such an enormous distention and bruising that large portions of the thin hymeneal fold are destroyed. The remnants shrink and form a few small roundish protuberances, from antiquity known as *carunculæ myrtiformes*, on account of their supposed resemblance to the fruits of the myrtle-tree (Fig. 161). There is always one on either side, and sometimes one or two more. In repeated pregnancies they sometimes undergo hypertrophy, and hang coxcomb-like out from the vaginal entrance. It must, however, be borne in mind that parts of the hymen may also be destroyed by gangrene or syphilitic ulceration.

FIG. 161.

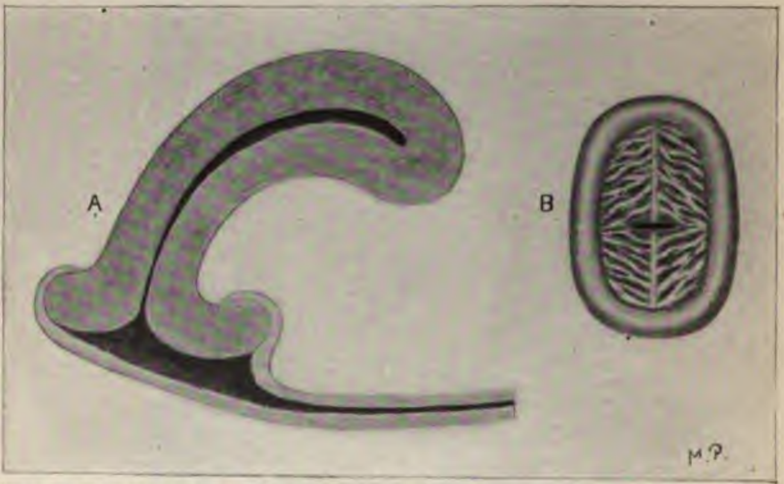


Hymen of woman who has borne one child.

The vagina of a primigravida is comparatively narrow and has preserved its normal columns and rugæ. In the plurigravida the canal is wider, smoother, and often we feel—in consequence of a tear of the levator ani muscle and its two accompanying fasciæ, the anal below and the rectovesical above, at a preceding birth—a V-shaped gap on the posterior wall, most frequently on the right side.

In nulliparous pregnant women the cervical portion is cone-shaped and longer; the os externum is small, round, and closed, except towards the end of pregnancy, when it may admit the finger; but even then the upper part of the canal with the internal os remains closed. In women who have given birth to a child, the cervical portion is cylindrical and shorter; the os externum forms a transverse slit with an anterior and a posterior lip; often it is torn, especially in the sides; the os is open, the cervical canal is funnel-shaped, being widely open below and tapering upward. During the last month even the internal os often is open and allows one to place the finger directly on the ovum and the presenting part. Occasionally, however, two lips may form in a nulliparous woman. The writer has treated an unmarried lady about eighteen years of age for anteversion and anteflexion with menorrhagia and profuse leucorrhœa in whom there were two thick everted lips, the anterior measuring one inch and the posterior three-fourths of an inch (Fig. 162). The cervical canal formed a transverse slit one-fourth of an inch wide. The cavity measured from the base of the lips to the fundus two and three-fourths inches.

FIG. 162.



Hypertrophy of vaginal portion in a virgin simulating a laceration of the cervix. *A*, side-view of supposed sagittal section; *B*, the cervix seen from below.

The hymen was not ruptured, but lax. The abdominal wall was tense and had no cicatrices. She had probably masturbated, but I have every reason to believe that she had never had connection. On a smaller scale the writer has frequently seen a cervix with two lips in virgins. The diagnosis from a torn cervix is, however, easy by the softness of the tissue and the absence of any cicatricial plug in the angle between the lips.

FIG. 163.

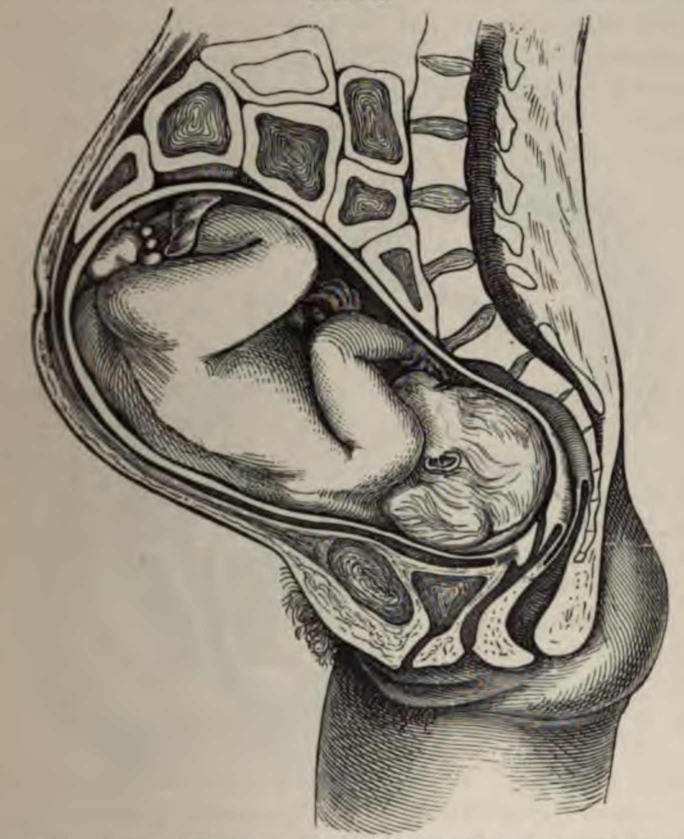


Diagram of a sagittal section in the median line of a primigravida in the last month of pregnancy. (Olshausen-Veit.)

In the first pregnancy with head presentation, the head, if there is no disproportion between it and the pelvis, during the last month, or even earlier, sinks down into the pelvic cavity (Fig. 163), or is at least pressed against the brim, while in following pregnancies it remains in the abdominal cavity till the end of pregnancy (Fig. 164.)

Towards the end of the first pregnancy the upper part of the cervical canal is taken up by the ovum, and consequently the remainder of the canal is shorter, while in following pregnancies the head does not descend into the cervical canal, which retains its whole length.

The fourchette is mostly torn during childbirth, and then we will find white, hard, cicatricial lines at its place. In this connection we should, however, remember that the raphe forms a somewhat irregular whitish line that may be mistaken for a cicatrix after a healed perineal tear.

FIG. 164.

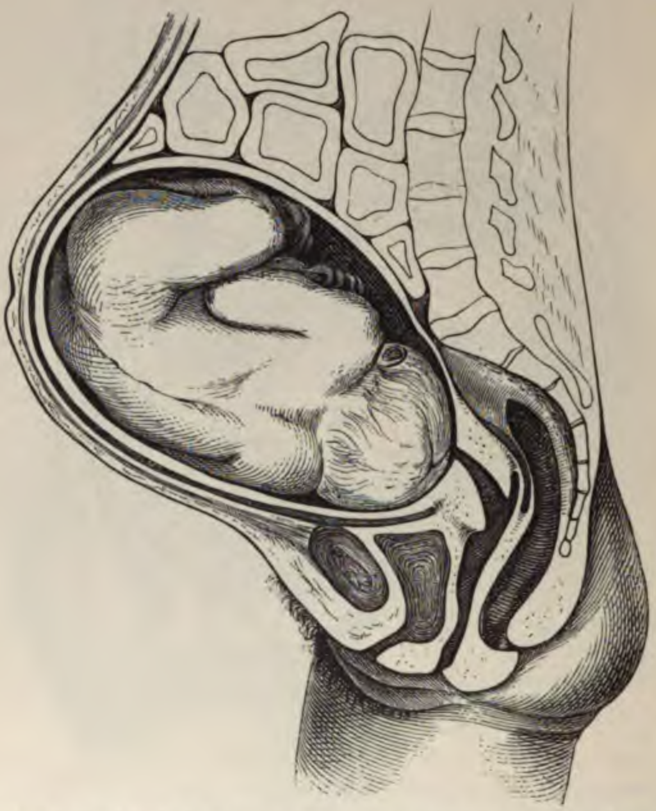


Diagram of a sagittal section in the median line of a plurigravida in the last month of pregnancy. (Olshausen-Veit.)

In a primigravida the abdominal wall is tense, the fundus uteri is carried more backward, and there are only purple—no white—striæ. In a plurigravida the abdominal wall is flaccid, easily folded, and marked by old white striæ. Sometimes there is such a diastasis between the recti and the pyramidales muscles that the uterus feels as if it were lying right under the skin. The wall may even become translucent, so that small myomas on the surface of the womb or enlarged vessels may be seen.

During the first pregnancy the *breasts* preserve much of their elasticity and stand out from the chest. In women who have nursed a child they are pendulous. Sometimes there are cicatrices from a mammary abscess. The *nipple* is in the first pregnancy broader at its base than at the apex, while after lactation it becomes globular and pedunculated.

There is hardly any absolutely decisive single sign by which the question whether childbirth has gone before can be settled; but by taking all the signs together we can nearly always arrive at a positive result. It is much more difficult, and sometimes impossible, to tell whether or not a woman has had a miscarriage. A small fœtus may pass the genital canal without causing any tears leading to cicatrices. The larger the fœtus is, the more the condition will approach that described above for cases of previous childbirth.

CHAPTER XXVII.

BACTERIOLOGY OF THE VAGINA.

BACTERIOLOGISTS differ much in their statements about the bacteria found in the vagina of pregnant women, a subject that is of the greatest importance in order to decide whether or not autoinfection is possible, and whether prophylactic antiseptic douches should be given before labor. Based on the examination of ninety-two pregnant women, Dr. Witridge Williams, professor of obstetrics in the Johns Hopkins University, of Baltimore, corroborates the conclusion arrived at by Kroenig and Menge, that no pus-producing bacteria—streptococcus pyogenes, staphylococcus aureus or albus—are found in the vagina of pregnant women. Even the vaginal secretion of unimpregnated women has bactericidal properties, and this faculty is enhanced during pregnancy. According to these authors, the positive results of their opponents are due to the faulty way in which they obtained the secretion, leading to admixture of microbes from the vulva or hymen. On the other hand, their negative results are attributed by their adversaries to the use of unsuitable substances for culture. According to them, streptococci are found in the vagina of twenty per cent. of healthy pregnant women. The gonococcus is occasionally found in the vaginal secretion, and may during the puerperium extend from the cervix into the uterus and tubes. It is possible that the vagina may in very rare instances contain bacteria which may give rise to sapræmia and putrefactive endometritis by autoinfection. Some of the vaginal bacilli are gas-producing.[1]

---

[1] J. Witridge Williams, Trans. Amer. Gyn. Soc., 1898, vol. xxiii. pp. 141–183.

CHAPTER XXVIII.

DRESS AND REGIMEN DURING PREGNANCY.

Although a physiological condition, pregnancy is so often accompanied by some disturbance of the woman's health that she should take particular care of herself during that period and prepare herself for the ordeal of parturition and the duties that will devolve upon her as a mother. It is true that the Indian squaw and the European field-worker do not change their mode of living, but march and ride on horseback or pick up stones from the ground till labor sets in. But what suits savages and what poor people are obliged to do for a living cannot be used as a standard for the civilized woman in easy circumstances. There is no doubt that by hard physical exercise many a miscarriage is brought on that might have been avoided under more favorable circumstances, and those poor women lose shape and attractiveness and become old before their time. Let, therefore, the man who can afford it surround his pregnant wife with all the care called for by the changes going on in her body, and let the women themselves forego pleasures that are injurious and at the same time make such changes in their habits as their condition requires.

In general, we may say that a pregnant woman may continue to live as she is accustomed to do. She must not think that she cannot work and walk and eat and drink and bathe as she previously did, provided her mode of living was a natural and healthy one. If she has not hygienic habits, it is the time to adopt them during her pregnancy. We have seen above that during pregnancy the blood becomes thin, as the pale cheeks and lips of the pregnant woman tell us, without counting her red blood-corpuscles. The act of giving birth to a child is technically called labor. For most women it is, indeed, the hardest labor they are called upon to perform in the whole course of their lives. When their hour comes, no loving husband nor devoted parent can take the burden from their shoulders. Thus two indications for our conduct present themselves. The pregnant woman should have substantial food and fresh air, and she should use her muscles. In the beginning, when she suffers much from nausea and vomiting, there is loss of appetite with danger of inanition. It is, therefore, important that she should take such food as she can retain and that it should be nutritious. In this respect milk is the best of all. One can drink when it is impossible to chew solid food. Later, as a rule, she has a voracious appetite, and must then be cautioned not to overload her stomach. It is well to take two or three small meals between the three large ones. She should avoid late suppers and spiced food. Otherwise she may eat what she likes, and if she is accustomed to take beer or light wines with her meals, there is no reason why she should not partake of them during her pregnancy. Stronger liquors should be avoided, as well as strong tea and coffee. She should have plenty of sleep, at least eight hours out of the twenty-four. It is well to rest an hour in the middle of the day, whether she sleeps or not. This applies especially to the last three months, when the large uterus presses on the pelvic organs and interferes with the free circulation in the lower extremities. The longer time she spends in the open air the better. It is also advisable to leave the windows of her bedroom wide open in summer-time, and not to close them entirely even in the cold season. The pregnant woman should take long walks every day, even in bad weather. She may also ride in street-cars and on railroads, but she should avoid being jolted in a carriage going over bad roads. She should not ride on horseback, wheel, dance, jump up and down stairs, climb mountains, play tennis, skate, or swim. Light gymnastic movements, giving the arms a similar chance to be used to that which the legs have in walking, are to be encouraged. There is no reason why she should not make a bed or prepare a meal if she is wont to do so.

She should have a movement of the bowels at least once a day. As there is a tendency to constipation, often special measures have to be taken to obtain this. Nearly all fruits and vegetables have an aperient effect and should, therefore, form part of the diet. Especially grapes and oranges taken before breakfast are useful. If any medicines are prescribed, they should be of the mildest, such as magnesia, rhubarb, cascara, or senna. But the writer has found that some of the worst cases of constipation yield to the regular use of distilled water, of which a quart is drunk on an empty stomach every morning, a tumblerful every quarter of an hour. Salines are said to have an injurious influence on the development of the child, especially on that of the bones. If the woman has not had a movement in the course of the day, she should take an enema of a quart of soapsuds before retiring.

In the choice of clothing, the leading ideas should be to secure sufficiently warm wearing apparel, avoiding pressure and heavy weight on the abdomen. The *décolleté* dress of society leaving half the chest unprotected is out of the question. The pregnant woman should be covered with woollen underwear all over her body up to the neck. Then she will not need many articles of dress. Her petticoats are loosely buttoned or bound around the waist. The common corset, exercising great pressure in the direction of the pelvis, should be proscribed. The woman should either go without any or have one of those especially made for the purpose without steels or whalebones.

On the other hand, an abdominal supporter, preferably made of flannel, is recommendable, especially in repeated pregnancies. It prevents too great a distention of the abdominal wall and is thus serviceable in helping the woman to regain her shape after delivery, and not look as if she were always pregnant or suffering from an abdominal tumor. Round garters should be replaced by side garters.

The woman should take a lukewarm bath, about 95° F., once a week, and, as there usually is some increase of vaginal secretion, she should wash the perineum daily with lukewarm water. If the secretion constitutes a discharge that irritates the skin, there is no objection to vaginal injections medicated with mild astringents, such as borax or alum, of lukewarm temperature, and in small quantities (ʒi to Oi), once or twice a day. Surf bathing should be forbidden, but there is no objection to still water baths of short duration,—maximum, a quarter of an hour.

The nipples should be washed and kept free from crusts. If they are short, they may be pulled upon several times daily in order to elongate them and render them more fit for lactation. If there are none, they cannot be formed, and the woman cannot nurse her child. Their skin may be mollified by daily inunction with albolene, lanolin, cold-cream, or other greasy substances, and it may be hardened by washing it with brandy or cologne or painting it with a solution of tannic acid,—*e.g.*, glycerite of tannin (ʒi to ℥i). It is doubtful if these measures prevent sore nipples during lactation, which seem to be an unavoidable accompaniment of its earlier stage; but the patient likes to do something to prepare herself, and might take her physician to task if he had not advised any preventive. The nipples should be protected against pressure from the clothing.

The mental condition should not be neglected. It is much better for the pregnant woman to have pleasant company than to brood in idle solitude over her coming confinement. Friends should carefully abstain from all grewsome stories and preserve her from anxiety and worry. Perusal of light literature, interest in what is going on in the world, and attention to daily duties are all valuable elements of a healthy mental atmosphere.

Under ordinary circumstances connection can hardly be totally avoided, but any excess in this direction should be deprecated. In women who, on account of anteflexion of the uterus, conceive with difficulty and easily lose the fœtus, the writer forbids intercourse in the third and the sixth months, periods at which abortion is particularly liable to occur.

The physician should examine the urine for albumin, even in apparently healthy women, at least once a month.

PART III.—NORMAL LABOR.

CHAPTER I.

CAUSES OF LABOR.

In a general way one may say that labor begins when the time has come. Why this period in woman and the cow should be about nine months, in the elephant about twenty months, and in dogs about two months cannot be told any more than why morphine makes one sleep and coffee keeps one awake. As the great German poet-philosopher Goethe says, "Care has been taken that trees do not grow into heaven" ("Es ist dafür gesorgt dass die Bäume nicht in den Himmel wachsen"). There is a regulating power that has bound natural processes within certain limits of time and space. But we may perhaps find what means are employed to determine the transition from pregnancy to labor. In all probability there are several causes operating in combination with one another. Fatty degeneration of the decidua makes a foreign body of the ovum, which irritates the nerves of the uterus and produces muscular contraction, in a way similar to that in which a bougie works which we introduce into the cavity of the uterus when we want to induce premature labor or strengthen ineffective labor pains. When this theory is impugned on the ground that uterine contraction sets in even in cases of extra-uterine pregnancy, it must be remembered that even in ectopic gestation a decidua is formed and has to be expelled.

In the placenta a change gradually takes place, the intervillous spaces becoming reduced in size by an invasion of giant cells, which begin to appear among the decidual cells as early as the third month, and gradually cause a thrombosis of the sinuses. The effect of this process is to render the blood—both that of the mother and that of the fœtus—more venous in character, and a surplus of carbonic acid in the blood makes the uterus contract. When under Louis Philippe the French army was warring in Algeria, a tribe of Kabyles sought refuge in a large cave. The French general built a fire at the entrance. Those in the cave were suffocated, and it was found that all pregnant women in the tribe had aborted.

In consequence of the growth of the child the tension in the wall of the uterus becomes greater and greater, and there must come a moment when the expansion can go no further. This tension, combined with the weight of the fœtus, presses the latter against the internal os, and, on the other hand, the cervix, gradually opening both from below and above, offers less resistance to the pressure from above.

Perhaps the congestion to the uterus that out of pregnancy takes place every four weeks, and induces the menstrual flow, continues in the pregnant woman, and at the end of the tenth lunar month results in labor.

The exciting cause that, finally, makes the uterus contract sufficiently to dilate the cervix and expel the fœtus is doubtless irritation of the large cervical ganglion, which in the pregnant condition attains such enormous dimensions, be the stimulus mere mechanical pressure or be it of a chemical nature. So much is sure, that the beginning of labor may be hastened by physical exertion and retarded by rest. Often it is brought about by strong mental emotions,—fright or joy. Opium retards it and aperient medicines further it. A busy downtown practitioner of the writer's acquaintance manages sometimes to attend personally to five confinements in one day by a judicious use of hypodermic injections of morphine in some cases and the administration of a dose of castor oil in others. Ambitious house-surgeons in Maternity Hospital, wanting to have as many cases as possible when their term of service was drawing to an end, used to give castor oil to all the women in the waiting ward who were at the end of pregnancy.

CHAPTER II.

THE ANATOMY OF THE PARTURIENT CANAL.

The parturient canal—that is, the parts through which the fœtus passes in a normal birth—is composed of hard and soft parts. The hard part is formed by the bony pelvis; the soft by the muscles that line it, the uterus, the vagina, and the vulva.

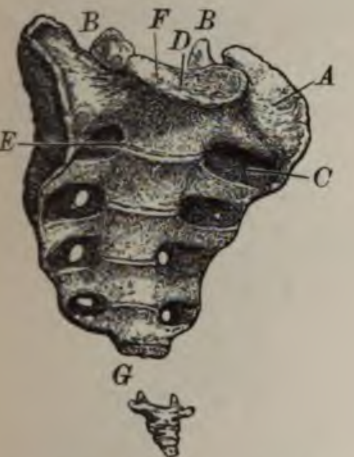
A. *The Pelvis.*

§ 1. **Bones of the Pelvis.**—The reader is, of course, supposed to have studied anatomy, so that it will be necessary only briefly to refresh his memory and then to examine the pelvis from the obstetrician's stand-point.

The pelvis is the large bony structure intervening between the vertebral column and the lower extremities. It is composed of four bones, two—the sacrum and the coccyx—situated in the median line and behind, and two—the hip-bones—placed laterally, on either side and in front.

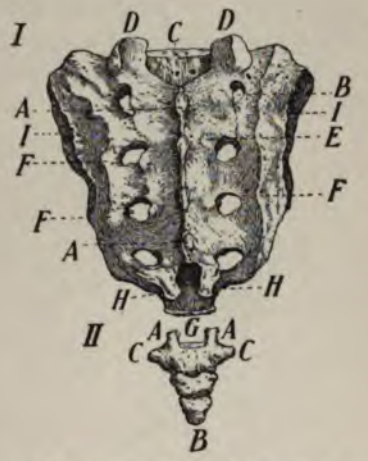
The SACRUM of the adult woman is a strong, somewhat pyramidal bone, on which we distinguish a base, an apex, an anterior and a posterior surface, and two lateral edges. The central part of the base is, by means of a fibrocartilaginous disk, like that connecting the vertebræ, joined to the fifth lumbar vertebra. Laterally it is expanded into the so-called *alæ*, or wings. Behind the central fibrocartilage is a triangular opening leading into the sacral canal, on either side of which is an *articular process* articulating with the corresponding process of the fifth lumbar vertebra. The apex is very much smaller than the base, and has the shape of a transverse narrow oval articulating with the coccyx.

FIG. 165.



The anterior surfaces of the sacrum and coccyx. *A*, ala, or wing; *B*, articular process; *C*, first anterior sacral foramen; *D*, articular surface connected with the body of the fifth lumbar vertebra; *E*, line of coalition between first and second sacral vertebra; *F*, promontory; *G*, articular surface connected with the coccyx.

FIG. 166.

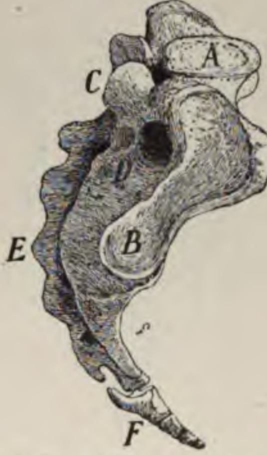


The posterior surfaces of the sacrum and coccyx. *I*, sacrum: *A*, sacral crest; *B*, first posterior sacral foramen; *C*, articular surface connected with the body of the fifth lumbar vertebra; *D*, articular process in contact with the corresponding process of the fifth lumbar vertebra; *E*, eminences representing the articular processes of the sacral vertebræ; *F*, eminences representing the transverse processes; *G*, apex: *H*, cornua; *I*, auricular surface. *II*, coccyx: *A*, cornua; *B*, apex; *C*, transverse process.

The anterior surface (Fig. 165) is strongly concave from above downward and slightly so from side to side. On either side are four openings, *anterior sacral foramina*, leading into the sacral canal. Outward these holes are continued as furrows for the sacral nerves. Transverse bony ridges extend between each two holes across the median line, marking the places where the bodies of the five vertebræ of which the sacrum is originally composed have grown together. Where the anterior surface joins the central articular surface of the base is a projecting, strongly convex line, called the *promontory*, which behind merges in the ala. Outside of the promontory is a smooth, thick, rounded-off edge, separating the anterior surface from the ala.

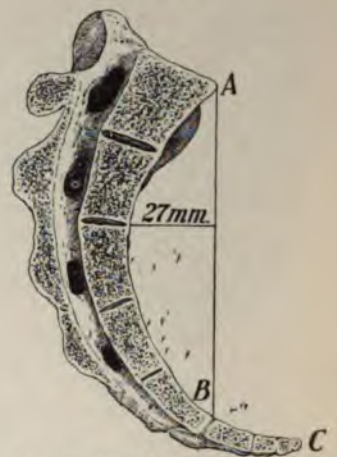
The posterior surface (Fig. 166) is strongly convex from above downward and somewhat so from side to side. It is narrower than the anterior surface, and very rough, serving for the attachment of the powerful erector spinæ muscle. In the median line are three or four small eminences, the *spinous processes*, usually more or less connected with one another, so as to form a ridge, the *sacral crest*. Below this ridge is a triangular opening, the lower end of the sacral canal, the sides of which end in small processes, the *sacral cornua*, which articulate with the cornua of the coccyx. Outside of the central ridge is a shallow groove formed by the united laminæ of the original sacral vertebræ. Outside of this, again, are found four *posterior sacral foramina*, corresponding to, but smaller than, the anterior, and leading into the sacral canal. Inside of each hole is a small eminence representing the articular process, and outside a larger one, corresponding to a transverse process.

FIG. 167.



Lateral edge of the sacrum. *A*, surface articulating with the body of the fifth lumbar vertebra; *B*, superficies auricularis; *C*, articular process; *D*, tubercles and hollows for the attachment of the sacro-iliac ligaments; *E*, sacral crest; *F*, coccyx.

FIG. 168.



The sacral canal. *A*, promontory; *B*, apex of sacrum; *C*, apex of coccyx. 27 indicates the depth of the sacral hollow,—27 millimetres, or a little over an inch.

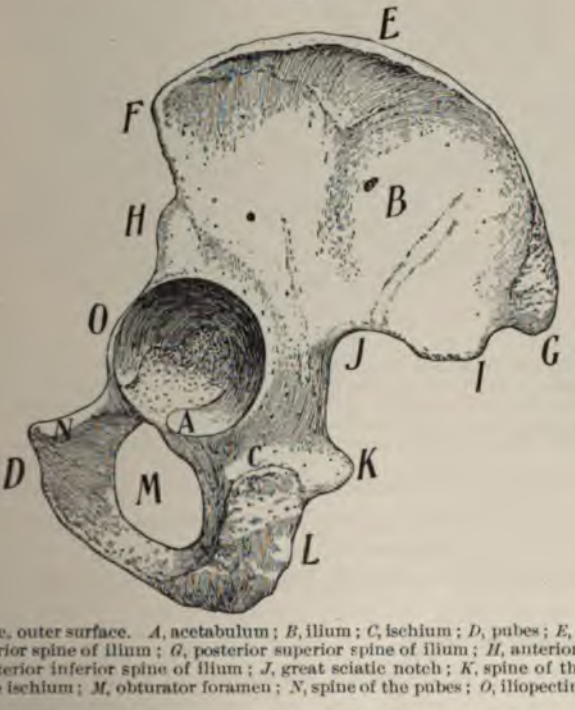
The side edges (Fig. 167) have above a large S-shaped surface, *superficies auricularis*, which articulates with the hip-bone. Behind this are deep depressions for the attachment of ligaments. The middle part of the side edge is concave and rough and serves for the attachment of the sacrosciatic ligaments. The lowest part forms together with the coccyx a notch for the fifth sacral nerve.

The *sacral canal* (Fig. 168) is curved like the bone, and contains the *cauda equina*.

The COCCYX (Figs. 165, 166) is a small triangular bony màss, composed of four rudimentary vertebræ, which in middle life usually grow together with one another, and in advanced age also with the sacrum. In the middle of the base is an oval surface articulating with the apex of the sacrum. Laterally and behind are two small articular processes, called *cornua*, which articulate with the cornua of the sacrum. On the lateral edge of the first coccygeal vertebra is a *transverse process*, forming together with the lower part of the side edge of the sacrum a notch for the fifth sacral nerve. The three other vertebræ are smaller than the first and are only rudimentary bodies.

The HIP-BONE, OS COXÆ, or OS INNOMINATUM, an irregular, large, and strong bone, has a shape that somewhat suggests a figure 8. It is originally composed of three bones, the *ilium* above, the *ischium* below, and the *pubes*, or *os pubis*, in front, meeting in the *acetabulum*, or *cotyloid cavity*, a deep hollow, forming the articulation with the thigh-bone.

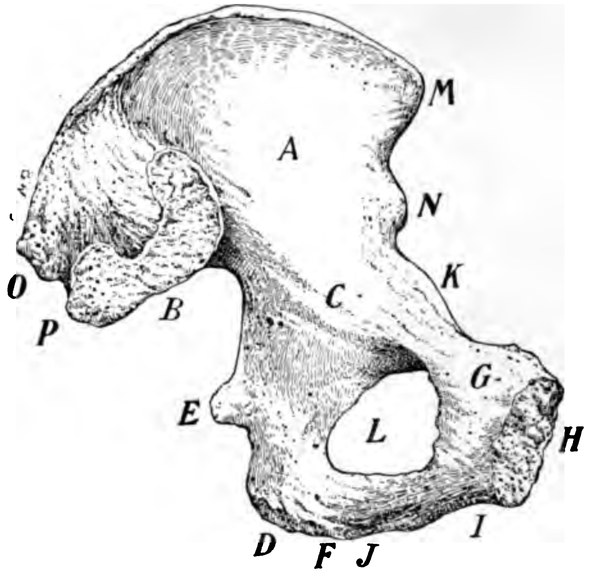
FIG. 169.



The hip-bone, outer surface. *A*, acetabulum; *B*, ilium; *C*, ischium; *D*, pubes; *E*, crest of ilium; *F*, anterior superior spine of ilium; *G*, posterior superior spine of ilium; *H*, anterior inferior spine of ilium; *I*, posterior inferior spine of ilium; *J*, great sciatic notch; *K*, spine of the ischium; *L*, tuberosity of the ischium; *M*, obturator foramen; *N*, spine of the pubes; *O*, iliopectineal eminence.

The *ilium* (Fig. 169) has a shovel-like shape and extends upward and to the side. Its upper border is thick and somewhat S-shaped and is called the *crest*. At its ends it runs out into small pointed processes, the *anterior superior* and the *posterior superior spine.* Under each of them is found another process, the *anterior inferior* and the *posterior inferior spine.* The outer surface serves for the attachment of the massy gluteal muscles (Fig. 170). The inner forms a large flat hollow, called the *iliac fossa*, where often the head of the fœtus finds a resting-place. Behind the iliac fossa is the large *auricular surface*, articulating with the corresponding surface of the sacrum. Inside from the iliac fossa is a smooth thick line, the *iliac portion of the iliopectineal line.* Behind the articular surface are rough surfaces for the attachment of the iliosacral ligaments and the erector spinæ muscle.

FIG. 170.



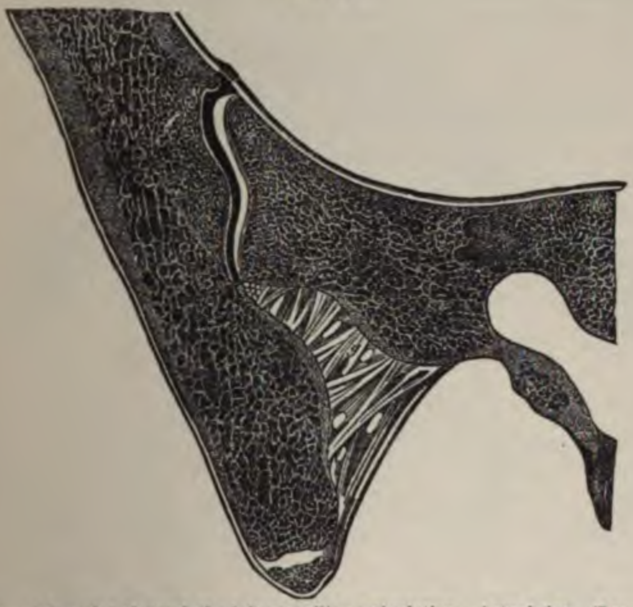
The hip-bone, inner surface. *A*, iliac fossa; *B*, auricular surface; *C*, iliac portion of iliopectineal line; *D*, tuberosity of the ischium; *E*, spine of the ischium; *F*, ascending branch of ischium; *G*, body of pubes; *H*, symphysis pubis; *I*, descending ramus of pubes; *J*, ascending ramus of pubes; *K*, iliopectineal eminence; *L*, obturator foramen; *M*, anterior superior spine of ilium; *N*, anterior inferior spine of ilium; *O*, posterior superior spine of ilium; *P*, posterior inferior spine of ilium.

On the *ischium* we remark the large *tuberosity* that serves as support for the body in the sitting posture, and behind that a small, flat, triangular projection, the *spine* of the ischium, which is of great obstetric importance, both as a landmark and as a point that influences the movement of the head of the fœtus during labor. The ischium has a smooth concave inner surface, a continuation of that of the ilium, and joins the os pubis by means of its *ascending branch.*

The *pubic bone*, or *os pubis*, has inward a quadrangular *body*, the posterior surface of which is smooth, slightly concave from side to side, and slightly convex from above downward. The anterior surface is rough and serves for the attachment of muscles going down to the thigh. On its inner border it articulates with the corresponding surface of the other pubic bone, forming the *symphysis pubis*. Below the body the *descending ramus* merges in the ascending ramus of the ischium. Above the body extends the *ascending ramus*, near the outer end of which is situated the low *iliopectineal eminence*. Outside of the upper end of the symphysis is a rough surface, called the *crest*, and terminating outward in the pointed *spine*, from which a sharp edge, the *pubic portion of the iliopectineal line*, extends to the iliopectineal eminence. Between the ischium and the pubis is a large oval opening, called the *obturator foramen*.

§ 2. **The Ligaments of the Pelvis.**—The pelvic bones are bound together by strong ligaments. Between the sacrum and the ilium there is the so-called *synchondrosis*, which in reality is a joint with a synovial membrane (Fig. 171). On the iliac side is a central prominence between two hollows, and on the sacral side a corresponding central concavity between two convexities. By this arrangement a kind of screw is formed, which permits a limited movement. Independently of pregnancy and in both sexes the sacrum is slightly movable, the promontory tipping forward and the apex backward during defecation. During pregnancy, when the parts composing the joint are softened, this motility is much increased, which allows the promontory to recede during the beginning of labor, and the apex to be pushed back when

Fig. 171.



Horizontal section through the left sacro-iliac articulation. Actual size. (Luschka.)

the head is passing through the lower part of the pelvis (Fig. 172). The sacro-iliac articulation is strengthened by the *anterior sacro-iliac ligament* in front, and the particularly strong *posterior sacro-iliac ligament* behind, which prevents the sacrum from falling into the pelvic cavity.

Fig. 172.

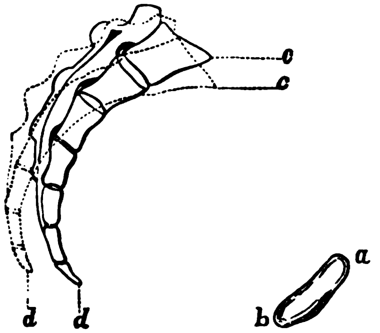
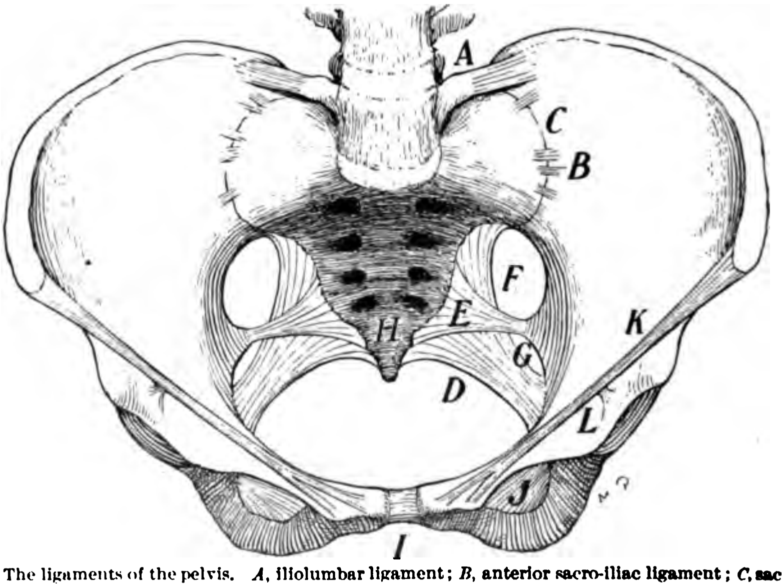


Diagram showing the oscillatory movements of the sacrum. (Duncan.) *a b*, symphysis pubis; *c*, *c*, promontory; *d*, *d*, apex of coccyx.

Between the sacrum and the ischium we have the *great sacrosciatic ligament*, or the *ligamentum tuberoso-sacrale*, and in front of that the *lesser sacrosciatic ligament*, or *ligamentum spinoso-sacrale*. By these two ligaments the sacrosciatic notches are converted into two foramina, the *superior* or *great sacrosciatic foramen* and the *inferior* or *lesser sacrosciatic foramen* (Fig. 173).

Between the sacrum and the coccyx is found a *fibrous disk*, and in it sometimes a synovial membrane. Between the cornua are *interarticular ligaments*. The union between the two bones is strengthened by the *anterior*, the ***posterior***, and the *lateral sacrococcygeal ligaments*.

Fig. 173.



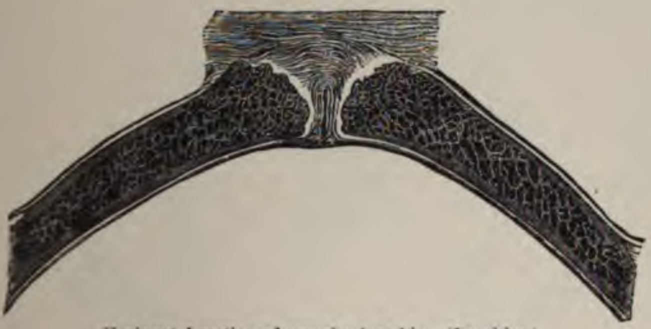
The ligaments of the pelvis. *A*, iliolumbar ligament; *B*, anterior sacro-iliac ligament; *C*, sacro-iliac articulation; *D*, great sacrosciatic ligament; *E*, lesser sacrosciatic ligament; *F*, great sacrosciatic foramen; *G*, lesser sacrosciatic foramen; *H*, sacrococcygeal articulation; *I*, symphysis pubis; *J*, obturator membrane; *K*, Poupart's ligament; *L*, Gimbernat's ligament.

The two pubic bones are bound together by a disk of cartilage and fibrocartilage, the *symphysis pubis* (Fig. 174), which is much thicker in front than behind and contains a small cavity with an imperfect synovial membrane. The synchondrosis is strengthened by the *anterior*, the *posterior*, and the *superior pubic ligament* and the *subpubic ligament*. The last is a thick triangular arch of sinewy, arched fibres, forming the upper limit of the pubic arch. During pregnancy the joint of the symphysis becomes softened and admits some degree of sliding.

The obturator foramen is closed by a thin fibrous membrane, the *obturator membrane*, from which spring the *obturator internus* and *obturator externus* muscles.

In the perineum we have two strong ligaments, the *transverse ligament of the pelvis* and the *ischioperineal ligament*. *The transverse ligament of the perineum* is a strong ligament lying immediately behind and below the subpubic ligament, together with which it strengthens the symphysis pubis. The *ischioperineal ligament* is a strong fibrous band inserted on the ischium just in front of the tuberosity. It goes transversely through the pelvic outlet, at the posterior margin of the transversus perinæi muscle, and, being connected with the fasciæ of the perineum, it constitutes the chief support of the pelvic floor.

FIG. 174.

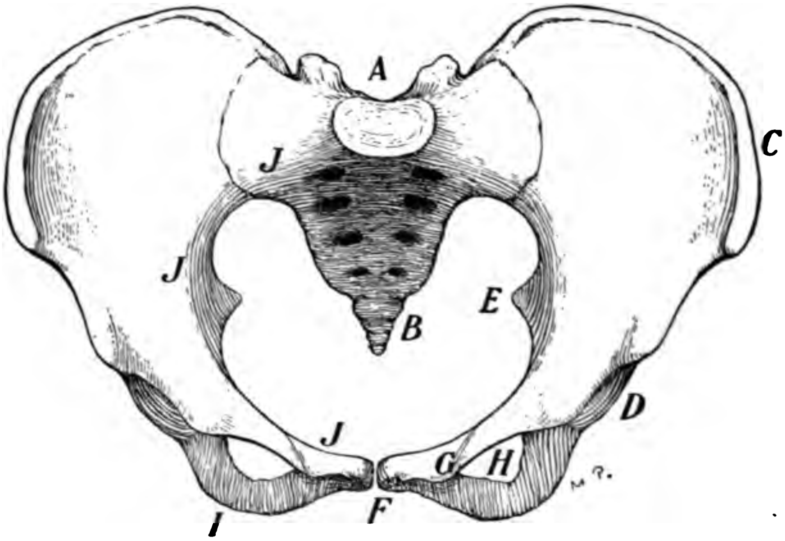


Horizontal section of symphysis pubis. (Luschka.)

§ 3. **The Pelvis as a Whole.**—The pelvis (Fig. 175) has its name from its supposed likeness to a barber's basin,—in Latin called pelvis. By the iliopectineal line, its continuation on the ala of the sacrum, and the promontory—a line which as a whole is sometimes designated *linea terminalis*—it is divided into a larger upper and a smaller lower part, respectively called the *large* or *false pelvis* and the *small* or *true pelvis*. The cavity of the false pelvis forms part of the abdominal cavity, while that of the true pelvis is specifically called the pelvic cavity. The cavity of the false pelvis is closed in front by the abdominal wall. It is of obstetrical interest only in so far as in pluriparæ the head during gestation often is found in one of the iliac fossæ, and because by measuring the false pelvis, which is much more accessible, we are enabled to form an idea of the dimensions of the true.

Measurements of the dry bony pelvis are needed in describing and comparing it with others. They are, of course, smaller than the corresponding measurements taken during life, all the soft parts having been removed. The distances measured on the false pelvis are that between the anterior superior spines of the ilium (Sp. Il.), which is 9 inches (twenty-three centimetres), and that between the most divergent points of the crests (Cr. Il.), which is 10 inches (twenty-five centimetres). Pelves differ in size in different individuals, and these figures, as well as the others that follow, represent only the average found by measuring a large number of pelves, and they give the average only approximately, leaving out of consideration small fractions, that would embarrass the memory without being of practical value.

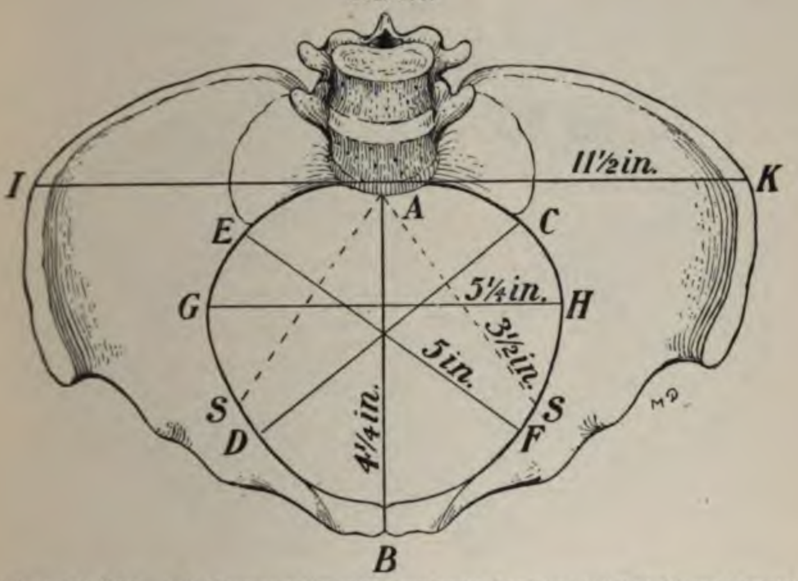
FIG. 175.



The normal female pelvis. *A*, sacrum; *B*, coccyx; *C*, crest of the ilium; *D*, acetabulum; *E*, spine of the ischium; *F*, symphysis pubis; *G*, spine of the pubes; *H*, obturator foramen; *I*, tuberosity of the ischium; *J J J*, linea terminalis.

The true pelvis is of much greater importance, and an accurate knowledge of it is an absolute requisite for good obstetric work. It forms a somewhat cylindrical curved canal, the upper opening of which is called the *inlet*, the *superior strait*, or the *brim* of the pelvis. The lower opening is called the *outlet*, or the *inferior strait*, and the intervening space, the *cavity* of the pelvis. The parts forming the *brim* do not all lie in one plane, the promontory rising above the remainder of the linea terminalis. This inlet has in the white woman somewhat the shape of a rounded-off heart on playing-cards. It is 16 inches in circumference. Four distances, so-called *diameters*, are measured in it; the anteroposterior diameter, also called the *true conjugate*, is the distance from the middle of the promontory to the upper end of the symphysis pubis, which is 4¼ inches (eleven centimetres). On account of the mobility of the sacrum, this measure is, however, variable. When the legs are stretched out, it becomes four millimetres (¼ inch) longer than when they are flexed on the abdomen, a point that may be used to advantage if the pelvis is somewhat small in comparison with the head of the child. It may also be used in examining the relative proportion between head and pelvis; by alternately stretching and flexing the thighs we can make the head move up and down. The *oblique diameter* goes from the iliosacral joint on one side to the iliopectineal eminence on the other, and measures 5 inches (twelve and three-quarters centimetres). The *transverse diameter* is situated between the two points of the iliopectineal line which are farthest separated from each other and measures 5¼ inches (thirteen and one-half centimetres) (Fig. 176). Finally, we distinguish the *sacrocotyloid distance*, drawn from the middle of the promontory to the point on the iliopectineal line where it is crossed by a line drawn at right angles with it through the middle of the acetabulum. This distance

FIG. 176.

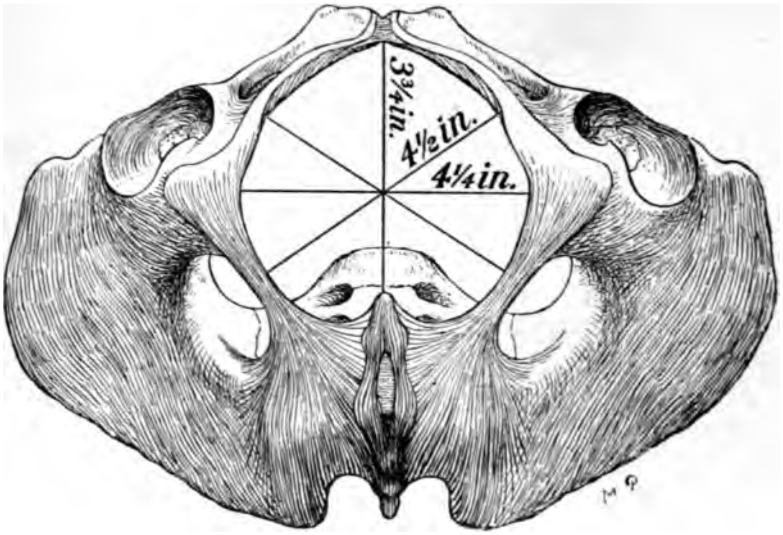


The pelvic inlet. *A B*, anteroposterior or true conjugate diameter; *C D*, left oblique diameter; *E F*, right oblique diameter; *G H*, transverse diameter; *A S*, sacrocotyloid distance; *I K*, crest of the ilium.

is normally about 3½ inches (from eight and three-quarters to nine centimetres). The oblique diameters are designated as right and left according to their posterior end. The right is a little longer than the left, and, on the other hand, the right sacrocotyloid distance is shorter than the left, a difference due to the greater use made of the right leg by which this side is pressed inward.

The upper end of the symphysis being turned outward, the true conjugate does not give the shortest distance between the promontory and the symphysis. This is found between the centre of the promontory and a point on the posterior surface of the symphysis situate from one-quarter to one-half inch lower down, and may be as much as one-half inch shorter than the true conjugate. This distance is called the *obstetrical, minimum,* or *available conjugate*, and measures only 4 inches (ten centimetres).

FIG. 177.



The pelvic outlet.

The *outlet*, or the *inferior strait* (Fig. 177), may be regarded as composed of an anterior and a posterior triangle touching each other by their bases. It is limited by the subpubic ligament in front, the apex of the coccyx behind, the tuberosity of the ischium, the ascending ramus of the ischium, the descending ramus of the pubes, and the sacrosciatic ligaments on the sides. Two diameters are taken in it, the anteroposterior from the lower end of the symphysis to the tip of the coccyx, which measures 3¾ inches (nine and one-half centimetres), and the transverse from one tuberosity of the ischium to the other, which is 4¼ inches (eleven centimetres) long; but, since during the child-bearing age the coccyx normally is movable and recedes during labor, the real distance that has to be considered is that from the lower end of the symphysis to the apex of the sacrum, which is 4½ inches (eleven and one-half centimetres). There is no oblique diameter in the outlet of the bony pelvis, but when the sacrosciatic ligaments are in place, the oblique diameter is taken from the middle of these ligaments to the juncture of the ascending ramus of the ischium and the descending ramus of the pubes. It measures 4½ inches (eleven and one-half centimetres). The circumference is 13½ inches (thirty-four centimetres).

The cavity, as a whole, is curved, with concavity turned forward. It is widest in a plane which may be supposed to go through the middle of the symphysis pubis, the connection between the second and third sacral vertebræ, and the acetabula. In this plane the anteroposterior diameter measures 5 inches (twelve and three-quarters centimetres), and the transverse a little less than 5 inches (twelve and one-half centimetres).

The narrowest part of the canal is a plane supposed to be laid between the lower border of the subpubic ligament, the lower end of the sacrum, and the spine of the ischium on both sides. In this narrowest plane of the pelvic canal the anteroposterior diameter measures 4½ inches (eleven and one-half centimetres), and the transverse from 4 to 4¼ inches (ten and one-half centimetres).

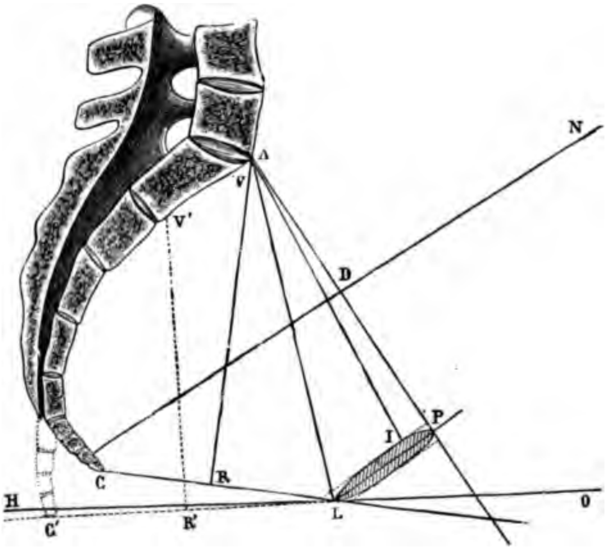
The pelvic canal is much shorter in front than behind, the symphysis measuring only 1¾ inches (four and one-half centimetres), the distance from the promontory to the apex of the coccyx about 6 inches (fifteen centimetres) along the bones and 5 inches (twelve and three-quarters centimetres) in the air-line. On the sides the distance from the linea terminalis to the tuberosity is 3¾ inches (nine centimetres).

The ascending ramus of the ischium and the descending ramus of the pubes form with those of the opposite side an angle, the *pubic arch*, which is from ninety-five to one hundred degrees, and is rounded out by the subpubic ligament.

The side walls of the true pelvis, formed by the ilium and the ischium, offer a smooth bony surface, which in the erect position is slightly concave in an anteroposterior line and slopes down to the outlet. A line drawn from the spine of the ischium to the iliopubic eminence divides it into an upper and a lower portion of nearly equal size. This hollow inclined plane exercises much influence on the rotation of the head during labor.

§ 4. **Inclination and Axes of the Pelvis** (Fig. 178).—Until the beginning of the nineteenth century the position of the pelvis in the body was not understood. The symphysis pubis was supposed to point nearly forward, a misconception which is preserved till this day in the name horizontal branch often given to the upper branch of the pubes, while in reality it ascends. When attention was directed to the fact that the pelvis has a much more inclined position than was formerly believed, greater importance was attributed to this inclination than it deserves from an obstetric stand-point. This inclination of the pelvis to the horizon is very variable, and depends much on the position of the lower extremities. It is smallest (from 40 to 50 degrees) when the thighs are moderately separated and slightly rotated inward. It is increased by bringing the knees together or separating them more, by increased rotation inward, or by rotation outward, and may reach 100 degrees. In the common erect position it is about 45 degrees. In order to give a pelvis the right direction, it should be held so that the anterior superior spine of the ilium lies in one perpendicular plane with the spine of the pubes, and the cotyloid notch points almost straight downward.

FIG. 178.



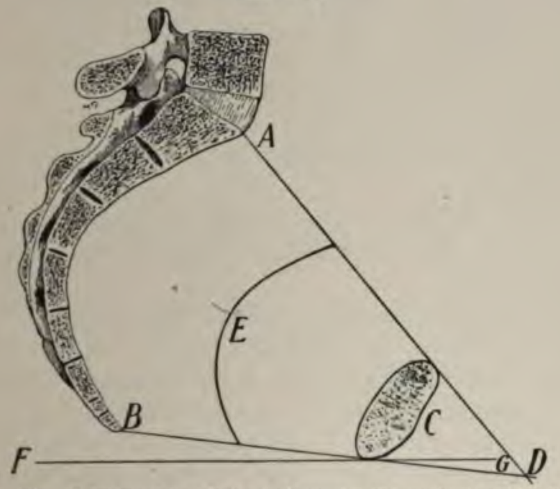
The inclination of the pelvis. (Tarnier and Chantreuil, l. c.) *A*, promontory; *P*, upper end of symphysis pubis; *C*, apex of coccyx; *C'*, apex of coccyx driven back; *L*, lower end of symphysis pubis. *A P*, true conjugate diameter; *A I*, minimum conjugate of inlet; *A L*, diagonal conjugate; *N C*, axis of inlet; *A R*, axis of outlet; *V' R'*, axis of outlet when coccyx is pushed back; *H O*, horizontal line.

The inclination of the outlet varies, of course, with that of the inlet. In the erect position the outlet points backward, forming with the horizon a small angle; but when the coccyx is pushed back, the outlet becomes horizontal or is even directed slightly forward.

When a person stands upright, the centre of gravity is behind a line uniting the centre of the acetabula, and the upper part of the body would, therefore, fall backward if the pelvis were not held forward by the strong iliofemoral ligament extending from the anterior inferior spine and adjacent parts of the ilium to the anterior intertrochanteric line of the femur.

To facilitate the comprehension of the form of the pelvic cavity, several lines are drawn which are called the axes. The *axis of the inlet*—that is, a line drawn perpendicularly through the centre of the conjugate—reaches the tip of the coccyx below and the umbilicus above. The *axis of the outlet* is a line drawn at right angles from the middle of the anteroposterior diameter. It strikes the promontory, but when the coccyx is driven back, this line strikes the lower end of the first sacral vertebra. The *axis of the pelvis* does not correspond to any regular mathematical curve. It is an irregular one obtained by the following construction. A line is drawn from the promontory to the upper end of the symphysis, another from the tip of the coccyx to the lower end of the symphysis. Both are prolonged in front of the symphysis until they meet each other, and from the point of intersection numerous equidistant straight lines are drawn to the median line of the sacrum and the coccyx. Finally, each of these lines between the symphysis and the sacrum and coccyx is divided into two equal parts and a line is drawn through all the mid-points. This is the axis of the pelvis. Since the symphysis and the two upper sacral vertebræ present practically parallel surfaces, the upper part of the

FIG. 179.



The axis of the pelvis. *A*, promontory; *B*, apex of coccyx; *C*, symphysis pubis; *D*, crossing point; *E*, axis of the pelvis; *F G*, horizontal line.

pelvic axis is nearly straight, while the lower approaches a circle drawn with the lower end of the symphysis as centre. The symphysis forms with the true conjugate an angle of about 100 degrees.

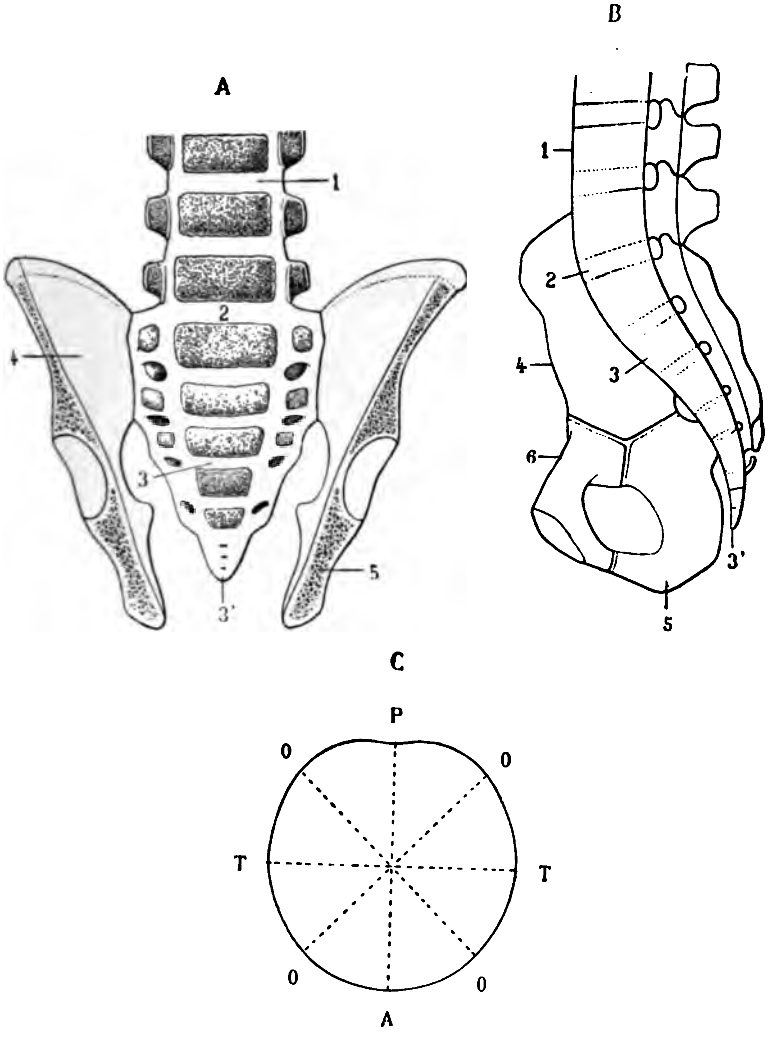
§ 5. **Differences between the Male and the Female Pelvis.**—The female pelvis is lower and wider than the male. The bones, corresponding to the weaker muscles, are lighter and more delicate in contour. The iliac fossa lies more horizontally. The distance between the crests of the ilium is wider. The sacrum is more curved, wider, and less projecting. Both the transverse and the anteroposterior diameters are longer. The pubic arch is wider,—from 95 to 100 degrees, while in man it is only from 70 to 75 degrees. The lower edges of the ascending ramus of the ischium and the descending ramus of the pubes are turned more outward. The pubic portion of the iliopectineal line is less sharp, and the posterior surface of the ascending branch of the pubes, as well as the symphysis, more convex, so as to facilitate the entrance of the head into the pelvic cavity. The obturator foramen is more oval, in man more triangular. The tuberosities of the ischium are more widely separated from each other. The acetabula look more forward. The distance from one trochanter to the other is greater, and the thigh-bones slant more inward towards the knees.

These sexual differences are congenital, but become more prominent after puberty, the pelvis during childhood being nearer the male type in both sexes.

§ 6. **The Pelvis of the New-born.**—The pelvis of the new-born child (Fig. 180) differs considerably from that of the adult woman. It is not only smaller, but also of a different shape. The five sacral vertebræ are separated, and the innominate bone is composed of three separate bones meeting in the acetabulum. The promontory is less marked and stands higher over the rest of the linea terminalis. The sacrum is straighter. Its alæ are narrower. The ascending branch of the pubes is markedly shorter. The pubic arch forms in both sexes an acute angle. The distance between the anterior superior spines of the ilia is nearly as great as that between the crests. The iliac bones take a more perpendicular course. The walls of the cavity slope more down towards the outlet. The brim is more round. Upon the whole, the pelvis in childhood comes nearer to the male type (Fig. 181).

The change from the infantile to the adult pelvis is due partly to an innate disposition, partly to the development of the uterus that takes place at puberty, but chiefly to the weight of the upper part of the body, pressure of the inferior extremities, tension of the pelvic ligaments, and pull exercised by muscular contraction. The weight of the superposed body presses the sacrum forward and downward, which will make the promontory jut more into the brim of the pelvis and bring it lower down. The weight falling more on the median parts than on the alæ, the lateral concavity becomes smaller, at the

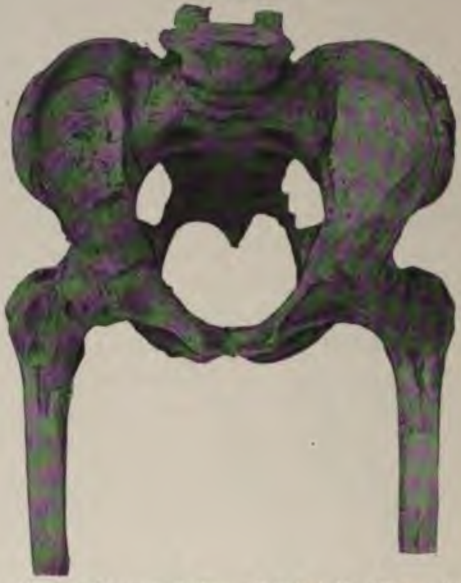
FIG. 180.



Pelvis of a new-born child. *A*, front view after removal of the anterior wall; *B*, side view after perpendicular section in median line; *C*, the brim. 1, lumbar part of the vertebral column; 2, promontory; 3, sacrum; 3', coccyx; 4, ilium; 5, ischium; 6, pubes. *A P*, anteroposterior diameter; *O O*, oblique diameters; *T T*, transverse diameter.

same time that, by combined pressure from above and resistance exercised by the sacrosciatic ligaments, the concavity from above downward increases. A similar action is exercised by the symphysis pubis and the sacro-iliac ligaments, the result of which is that the iliac portion of the linea iliopectinea becomes more bent, that the transverse diameters of the pelvis increase, and the pelvic brim approaches more an elliptical shape (Figs. 182, 183).

FIG. 181.



Pelvis of child. (Wood's Museum, Bellevue Hospital, No. 180, one-third actual size.)

In standing, walking, running, or making other movements with the lower extremities, the heads of the femora are pressed against the acetabula, and thus contribute to the curvature of the linea terminalis.

FIG. 182.

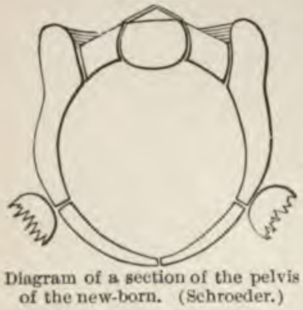


Diagram of a section of the pelvis of the new-born. (Schroeder.)

FIG. 183.

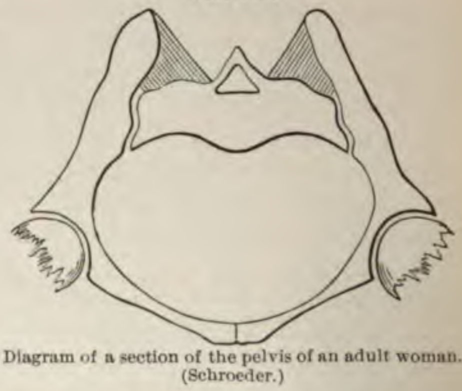


Diagram of a section of the pelvis of an adult woman. (Schroeder.)

§ 7. **Differences of the Pelvis in Different Races.**—From an anthropological stand-point four different forms are distinguished: (1)

the heart-shaped, (2) the elliptical with longest transverse diameter, (3) the circular, and (4) the elliptical with longest anteroposterior diameter. The first is the one found in white women and which we have described above. Indians, Javanese, and the Australian negresses have a more round pelvis. That of the African negress is more like that of the Caucasian race, while Hottentots and Bushwomen have pelves in which the anteroposterior diameters are longer than the transverse.

These racial peculiarities often give rise to hard labors when the parents belong to different races,—for instance, in Greenland, when European sailors have intercourse with Eskimo women.

Independently of these racial differences, we may even suppose that childbirth in general has undergone a change in the whole civilized world. In the beginning woman had probably not more difficulty in giving birth to her children than animals in bringing forth their young ones, but with increasing mental development and hereditary influences the heads doubtless became larger, while the pelves retained their old proportions. That heredity also plays a *rôle* in the shape of the pelvis is proved by numerous observations in obstetric practice, of cases in which daughters present the same pelvic peculiarities as their mother.

B. *The Soft Parts of the Parturient Canal.*

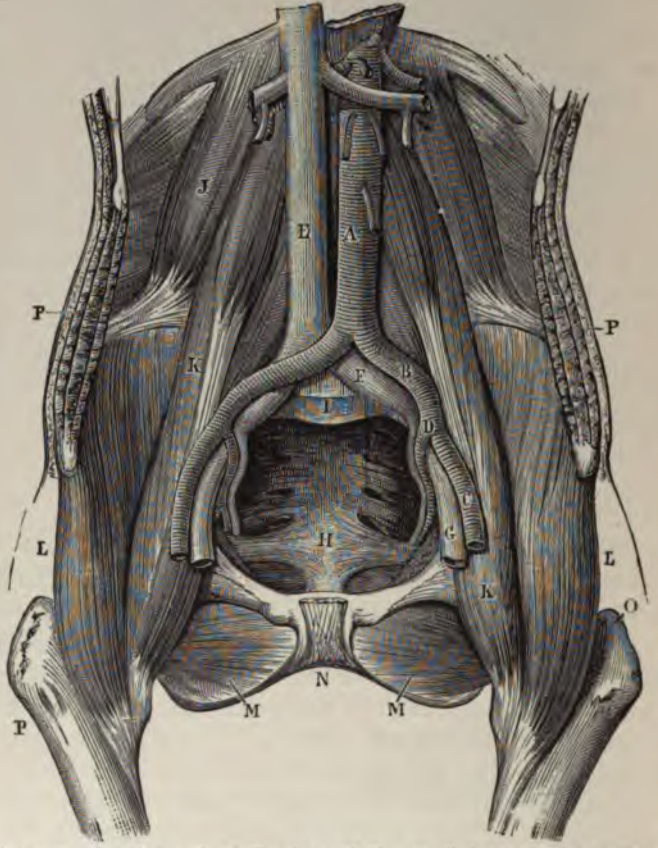
§ 1. **Muscles.**—The outlines of the bony pelvis become modified by the addition of muscular layers which form a padding to the hard bony surfaces or by their bulk diminish the available space. Thus the iliac fossa is lined by the flat *iliacus* muscle, which blends with the thick, fusiform *psoas magnus* (Fig. 184). The latter encroaches on the superior strait in front of the sacro-iliac joint and along the iliac portion of the iliopectineal line.

The *pyriformis* (Fig. 185) is a fan-shaped muscle arising from the anterior surface of the sacrum and nearly filling the great sacrosciatic foramen. It forms a padding for the posterior wall of the pelvis.

In front the pelvis is lined by the *obturator internus*, which arises from the obturator membrane and adjoining bones (Fig. 186) and passes out through the lesser sacrosciatic foramen.

The *perineal muscles* (Fig. 187) nearly close the outlet of the pelvis. In the urogenital triangle there are three pairs of small muscles, situated between the superficial perineal fascia and the anterior layer of the deep perineal fascia,—namely, the *ischiocavernosus*, or *erector clitoridis muscle*, the *bulbocavernosus*, or *sphincter vaginæ muscle*, and the *superficial transversus perinæi muscle*. They are of importance chiefly for the *rôle* they play in copulation. The ischiocavernosus muscle compresses the corpus cavernosum of the clitoris. The bulbocavernosus muscle presses on the vulvovaginal bulb. In joint action they cause erection of the clitoris. The bulbocavernosus also presses on the vulvovaginal gland and thus contributes to the lubrication of the parturient canal. The transversus perinæi muscle helps to steady the perineal body and push the presenting part of the fœtus forward during parturition.

FIG. 184.

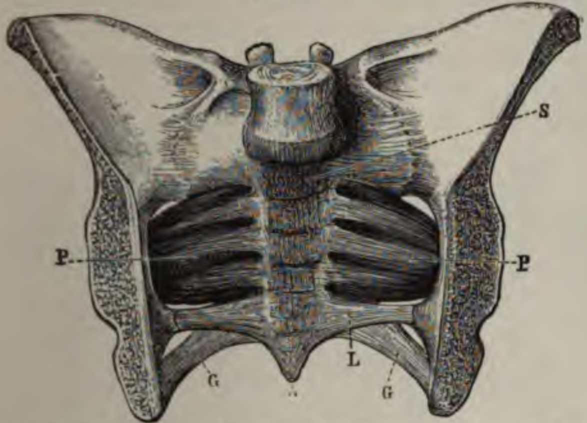


The pelvis covered with muscles. (Tarnier and Chantreuil, l. c.) *A*, the aorta; *B*, the left common iliac artery; *C*, the left external iliac artery; *D*, the origin of the left internal iliac artery; *E*, vena cava inferior; *F*, the left common iliac vein; *G*, the left external iliac vein; *H*, the attachment of the sacrosciatic ligaments on the sacrum; the dark mass above is the origin of the pyriformis muscles on the sacrum; *I*, promontory; *J*, quadratus lumborum muscle; *K*, psoas magnus (the psoas parvus lies in front of it); *L*, iliacus; *M*, obturator externus; *N*, the pubic arch; *O*, the large trochanter; *P*, section through the muscles of the anterior abdominal wall.

In the anal region we find the *sphincter ani externus.*

The deep muscles of the genito-urinary region are small and hardly of importance from an obstetric stand-point. In the anal region we have the *internal sphincter ani*, the *levator ani muscle*, and the *coccygeus*. Of these the first is only a thicker portion of the circular layer of the rectum, situated inside of the external sphincter.

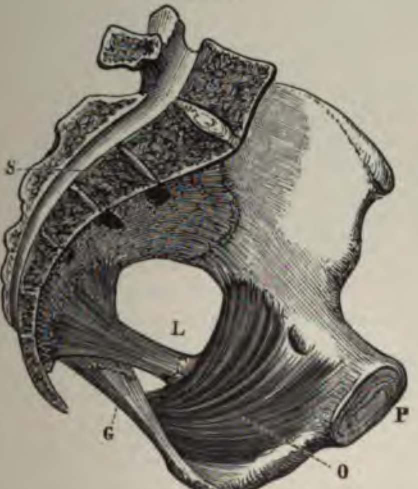
FIG. 185.



The posterior wall of the pelvic cavity, with the pyriformis muscles and the sacro-iliac ligaments. (Tarnier and Chantreuil, l. c.) *C*, coccyx; *G*, great sacrosciatic ligament; *L*, lesser sacrosciatic ligament; *P*, pyramidalis muscle; *S*, the first sacral vertebra.

The levator ani muscle (Fig. 188), on the contrary, forms an important part of the pelvic floor, and is of considerable interest from an obstetric stand-point. It is a horseshoe-shaped muscular expansion, which together with the coccygeus forms the *pelvic diaphragm*. It is open in

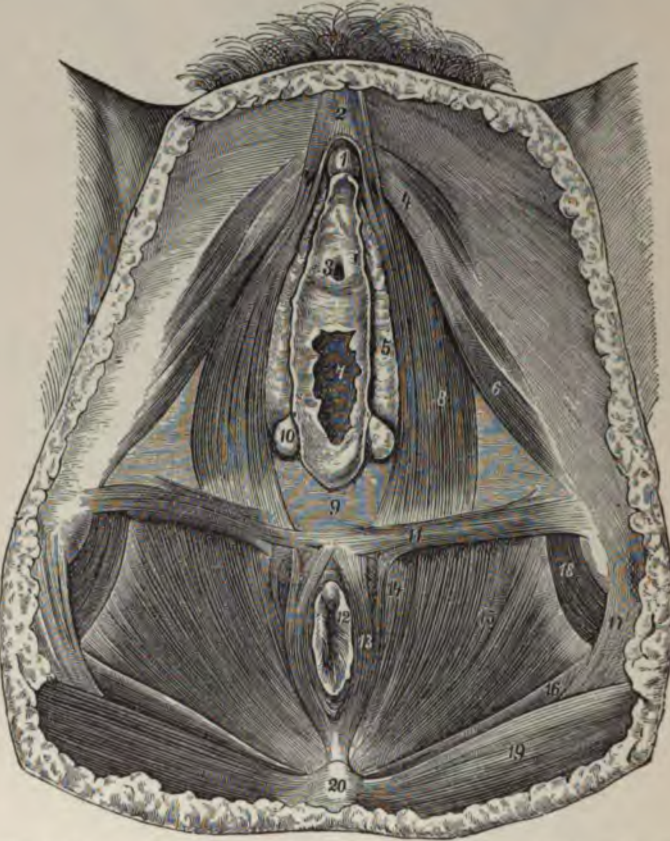
FIG. 186.



Side view of the pelvic cavity, showing the obturator internus muscle and the sacrosciatic ligaments. (Tarnier and Chantreuil, l. c.) *G*, the great sacrosciatic ligament; *L*, the lesser sacrosciatic ligament; *O*, the obturator internus muscle; *P*, symphysis pubis; *S*, union of the first and second sacral vertebræ.

front, and forms a double loop behind the vagina and the rectum. The levator ani and the coccygeus touch each other at their edges, so that one is a continuation of the other, and often they even coalesce. The levator ani arises from the posterior surface of the body of the pubic bone, from a point near the spine of the ischium, and from the tendinous arch of the pelvic fascia suspended between the two bony starting-points. Some loops go from side to side between the vagina and the rectum, but the greater part goes behind the intestine, hugging the concavity of its end-curve and supporting it from below (Fig. 189). Some fibres are inserted on the fourth vertebra of the coccyx. The *coccygeus* arises from the spine of the ischium and the

Fig. 187.

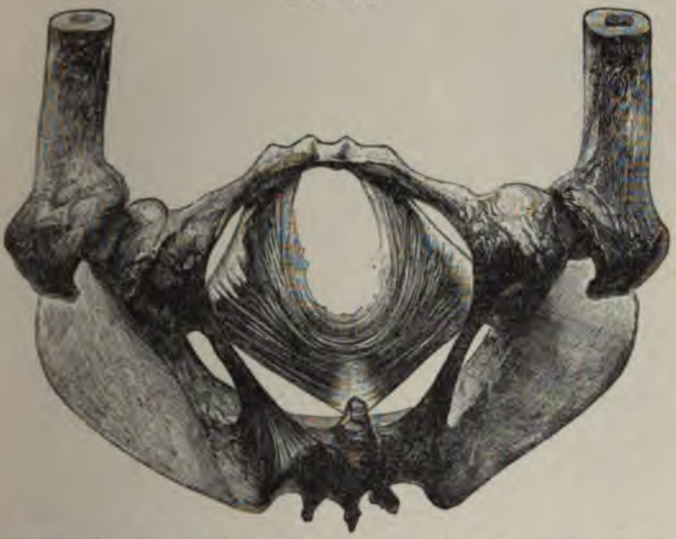


The muscles of the perineum. (Breisky.) 1, glans clitoridis; 2, corpus clitoridis; 3, meatus urinarius; 4, tendon of the ischiocavernosus muscle; 5, bulb; 6, ischiocavernosus muscle; 7, vaginal entrance; 8, sphincter vaginæ, or bulbocavernosus muscle; 9, fossa navicularis; 10, Bartholin's gland; 11, superficial transversus perinæi muscle; 12, anus; 13, sphincter ani externus; 14, 15, levator ani muscle; 16, coccygeus muscle; 17, great sacrosciatic ligament; 18, obturator internus muscle; 19, glutæus maximus; 20, os coccygis.

lesser sacrosciatic ligament. It spreads fan-like, and is inserted over the upper part of the coccyx and the last two sacral vertebræ.

Together with the two fasciæ that invest its upper and lower surface—the rectovesical and the anal fascia—the pelvic diaphragm forms a strong sheet on which rest the uterus and the bladder. This muscle lifts the rectum upward during defecation and draws the anus forward in the direction of the symphysis. During childbirth it pulls the vagina upward and pushes the child forward so as to make it turn around the pubic arch. It may also act as a sphincter of the vagina, and it draws the apex of the coccyx forward.

FIG. 188.



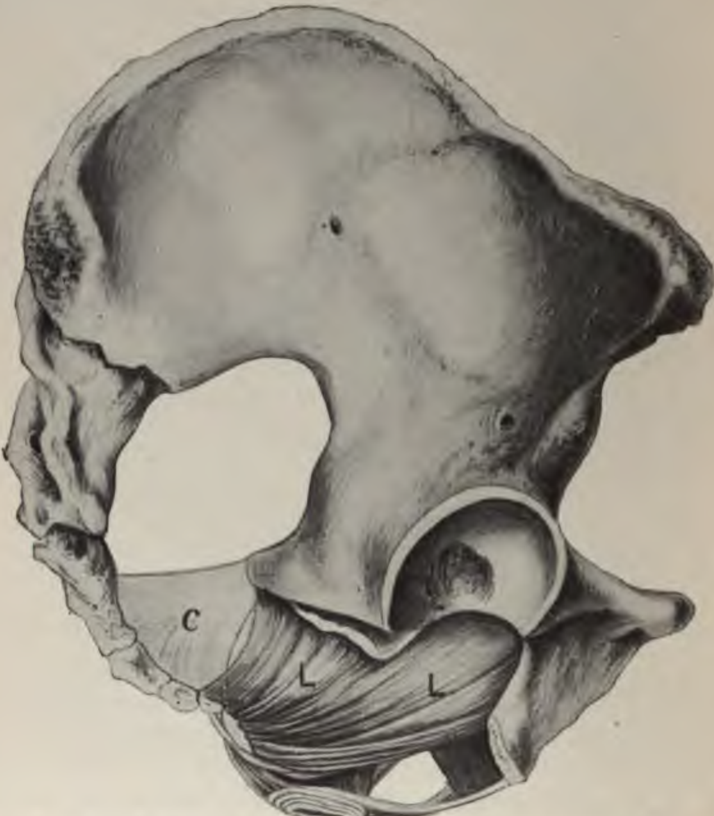
The levator ani muscle seen from below. (Dickinson.) The cut ends projecting inward are those which run into the rectovaginal septum.

§ 2. **The Fasciæ of the Perineum** (Fig. 190).—The urogenital region of the perineum has under the skin a layer of adipose tissue interspersed with fibrous tracts. Under that is found a sheet of dense connective tissue called the *superficial perineal fascia.* Under this lies the *deep perineal fascia*, or triangular ligament, which has two layers, a superficial and a deep. The superficial layer is at the sides attached to the ascending ramus of the ischium and the descending ramus of the pubes, and in front to the transverse ligament of the pelvis. Behind, this superficial layer of the deep fascia blends with the deep layer of the superficial fascia and with the deep layer of the deep fascia.

The deep layer of the deep fascia is likewise fastened to the rami of the pubes and the ischium. In front it covers the anterior portion of the levator ani muscle. Behind, it is continued as a dense fascial sheet covering the remainder of the lower surface of the levator ani muscle, and called the *anal fascia.*

The deep perineal fascia, as well as the rectovesical fascia, is perforated by the urethra and the vâgina.

FIG. 189.



Side view of the levator ani muscle. (Luschka.) The ischium has been removed. *L*, levator ani; *C*, coccygeus, faintly indicated.

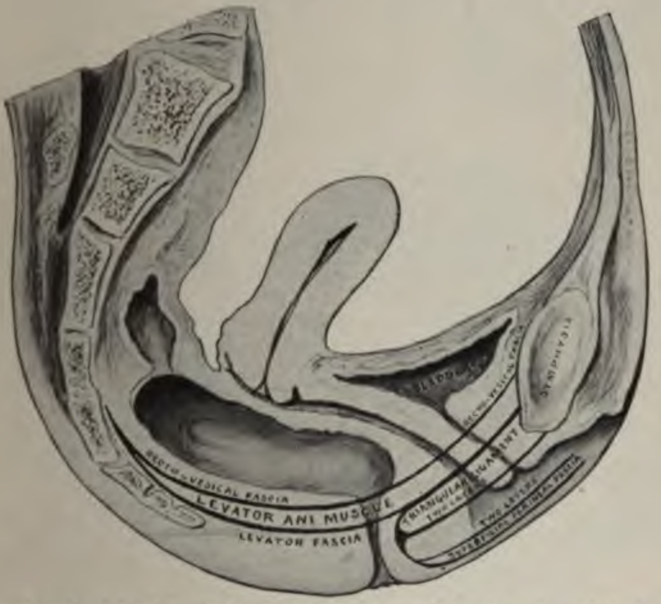
Where the superficial perineal fascia and the two layers of the deep perineal fascia blend, at the posterior margin of the superficial transversus perinæi muscle, they are fortified by the ischioperineal ligament, which forms the boundary-line between the urogenital and the anal regions.

By all these ligaments the pelvic bones are strongly bound together, and the soft parts prevented from too large excursions, so as to form a solid canal for the passage of the child.

The inside of the pelvis is covered by the pelvic fascia, and innermost the peritoneum. The spaces between the organs are filled with loose connective and adipose tissue, and since the uterus itself, towards the end of pregnancy and during labor, descends into the pelvic cavity, its walls also diminish the lumen of the pelvic canal.

Besides the soft parts lining the pelvis, the parturient canal is composed of the *uterus*, the *vagina*, and the *vulva*.

FIG. 190.



Pelvic and perineal fasciæ. (Dickinson.) Shows how the levator ani muscle is strengthened by dense sheets of fibrous tissue: 1, superficial perineal fascia, superficial layer, or subcutaneous adipose tissue; 2, superficial perineal fascia, deep layer, or superficial perineal fascia proper; 3, triangular ligament, or deep perineal fascia, superficial layer; 4, triangular ligament, or deep perineal fascia, deep layer; 5, vesicorectal fascia (a part of the pelvic fascia).

§ 3. **The Uterus. The Lower Uterine Segment.**—In an earlier part of this work we have described the changes the uterus undergoes during pregnancy. When labor begins, the uterus is divided into an upper active part and a lower passive part. This latter is called the *lower uterine segment*, and the line of demarcation the *contraction ring* (Figs. 191, 192).

This ring is situated where externally the peritoneum cannot easily be separated from the uterus, and where in the wall of the uterus lies the large coronal vein. In Braune's celebrated plate (Fig. 205) it is marked as being the internal os, but that is a mistake, microscopical examination having shown that the decidua continues one and a half inches (four centimetres) below the contraction ring.

Under the point where the decidual layer ceases the plicæ palmatæ of the cervix with columnar epithelium are found, and below the cervix the vagina with pavement epithelium (Fig. 193). The microscope has furthermore revealed that the white line which to the naked

Fig. 191.

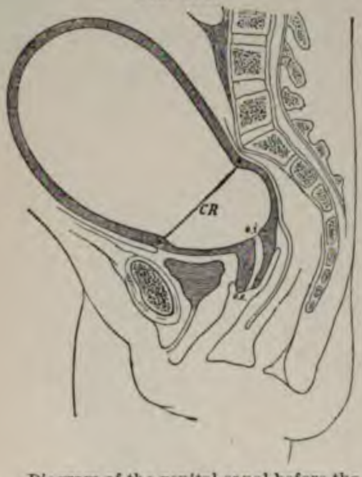


Diagram of the genital canal before the beginning of labor in a pluripara. (Schroeder.) *CR*, contraction ring; *o.i*, internal os; *o.e*, external os.

Fig. 192.

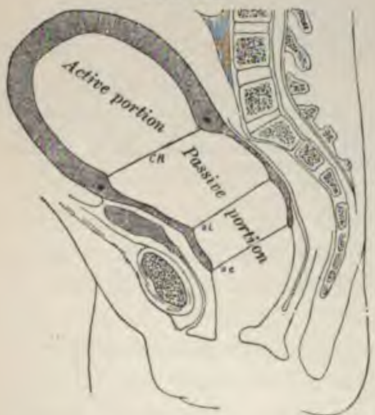


Diagram of the genital canal after the dilatation of the lower uterine segment and the cervical canal. (Schroeder.) Lettering same as in Fig. 191.

Fig. 193.

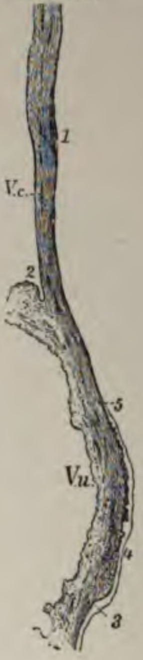


Fig. 194.

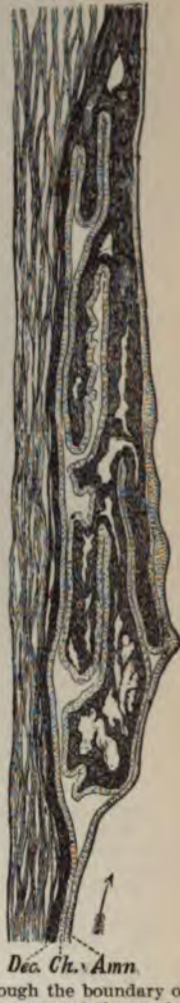


Fig. 193.—Section through the boundary of the ovum, the lower uterine segment, the cervix, and the upper part of the vagina. Nine-tenths natural size. (Chiari.) 1, boundary-line of insertion of the ovum; *V.c.*, coronal vein; 2, utero-vesical pouch of the peritoneum; *V.u.*, bladder; between 3, which simulates the external os, and 4, tesselated vaginal epithelium; from 4 to 5, cervix with plicæ palmatæ and columnar epithelium (the cilia lost); from 1 to 5, covered with a thin layer of decidua.

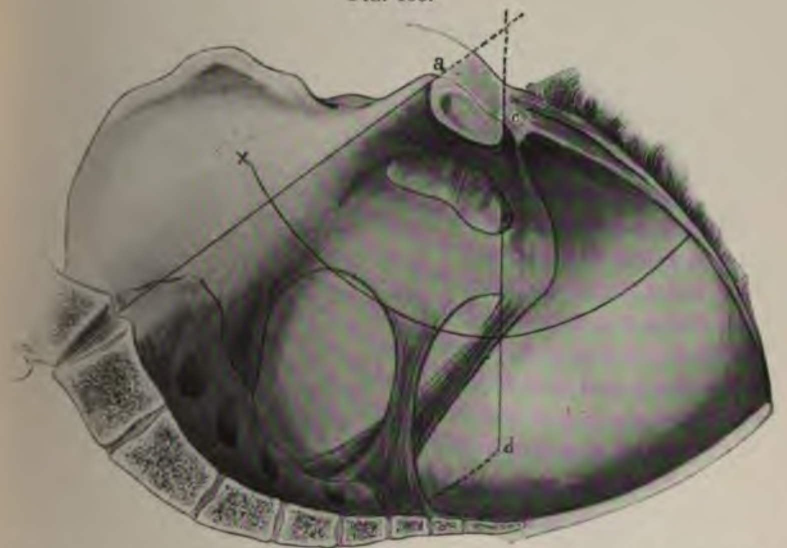
Fig. 194.—Boundary-line of the insertion of the ovum, enlarged ten times, showing folding of the decidua and chorion.

eye marks the boundary-line of the insertion of the ovum to the uterine wall is due to a peculiar folding of the chorion and the decidua (Fig. 194).

The contraction ring is felt by internal examination of the uterus, and can sometimes also be felt by abdominal palpation, and in cases of mechanical disproportion between the fetal head and the pelvis it may even be visible. In dead bodies it is less marked, because muscular contraction ceases.

§ 4. **The Cervix, the Vagina, and the Vulva.**—The cervix, the vagina, and the vulva have during pregnancy become so softened and enlarged that they can let the fœtus pass, for which purpose also space is gained by the unfolding of the plicæ palmatæ and the labia minora; but the perineum becomes enormously distended, so that its median line, which in the unimpregnated state measures only three-quarters of an inch, when distended by the head may be five or six inches long. By this elongation the soft parts of the genital canal form a continuation of the pelvic cavity, and the vulva turns more forward (Fig. 195).

Fig. 195.



The parturient canal. (Hodge.) *a*, the upper end of the symphysis pubis; *b*, the promontory; *c*, the lower end of the symphysis; *d*, the situation of the apex of the coccyx before it is pushed back; ×, the axis of the pelvis.

The points of the canal that before labor are narrowest undergo, of course, greater tension and are most liable to tear,—namely, the external os, the entrance to the vagina, and, in a lesser degree, the rima pudendi formed behind by the thin frænulum.

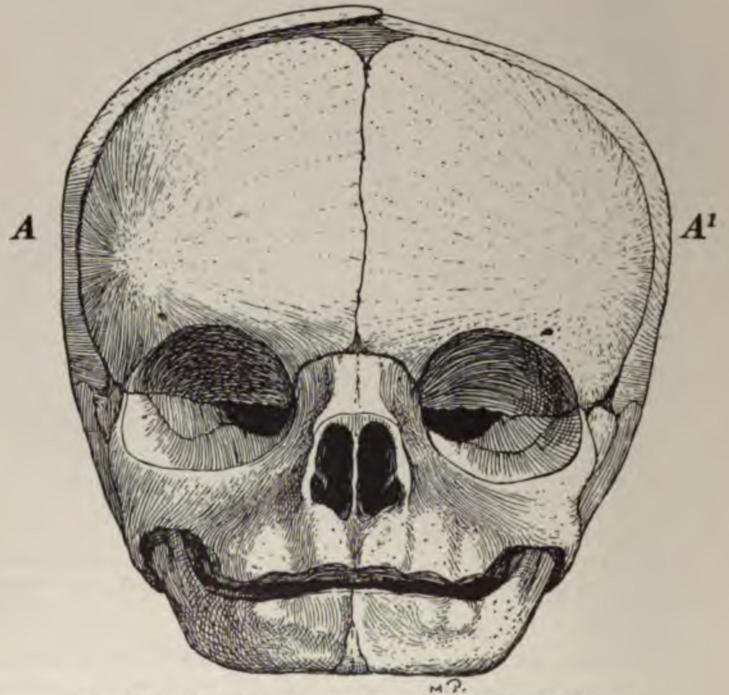
CHAPTER III.

THE FETAL HEAD.

After having studied the canal through which the fœtus is expelled, we shall turn our attention to the object that is to be expelled, and particularly the head of the fœtus as the least yielding part.

The head, as a whole, is a spheroid body (Figs. 196–199). The face is small and triangular. The skull is composed of a number of bones which are united by fibrous or cartilaginous tissue. There are *two frontal* bones and *two parietal* bones. The later *occipital* bone consists of four pieces—a *basilar* portion, two *condylar* portions, and an upper *tabular* portion which shows fissures between the four parts of which it was composed at an earlier period of development. The *temporal* bone consists of three pieces—the *squamozygomatic*, the *tympanic*, and the *petromastoid*. The great wings of the *sphenoid* bone are still separated from the body of the bone.

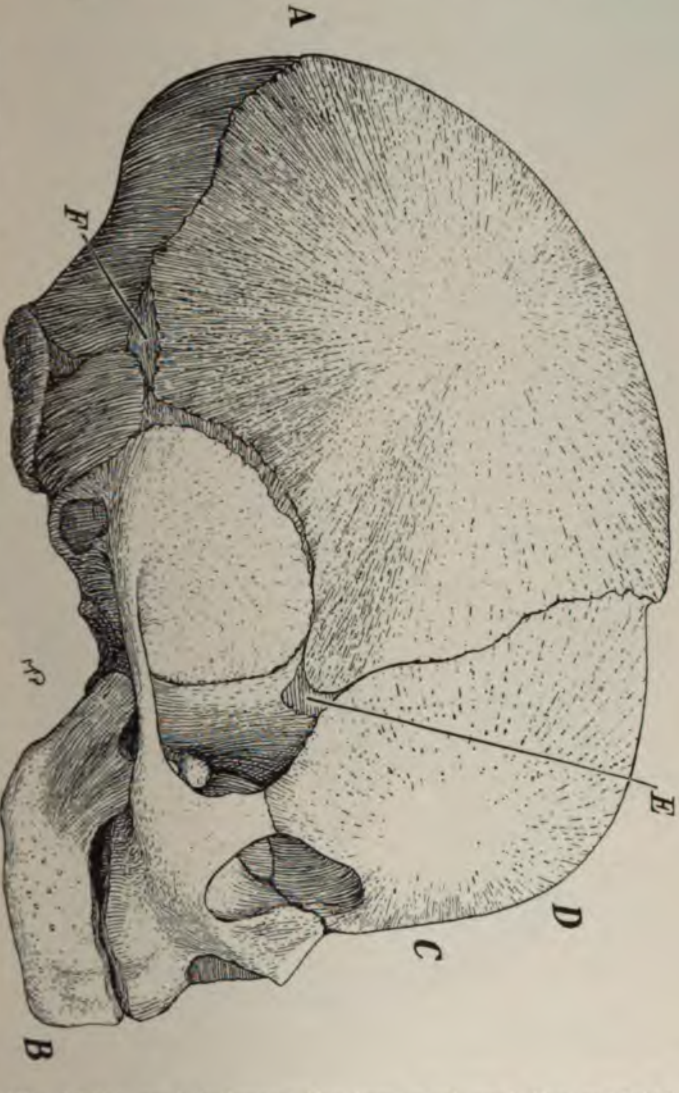
Fig. 196.



Fetal head, front view. Actual size. A-A^1, bitemporal diameter.

The lines in which the bones touch one another are called *sutures*. Between the two frontal bones runs the *frontal* suture (Fig. 196); between the frontal bones and the parietal bones lies the *coronal* suture (Fig. 197); between the two parietal bones is the *sagittal* suture (Fig. 198); between the parietal and the occipital bone is the *lambdoidal* suture (Fig. 199); and between the temporal and the parietal bone the *squamous* suture (Fig. 197).

FIG. 197.

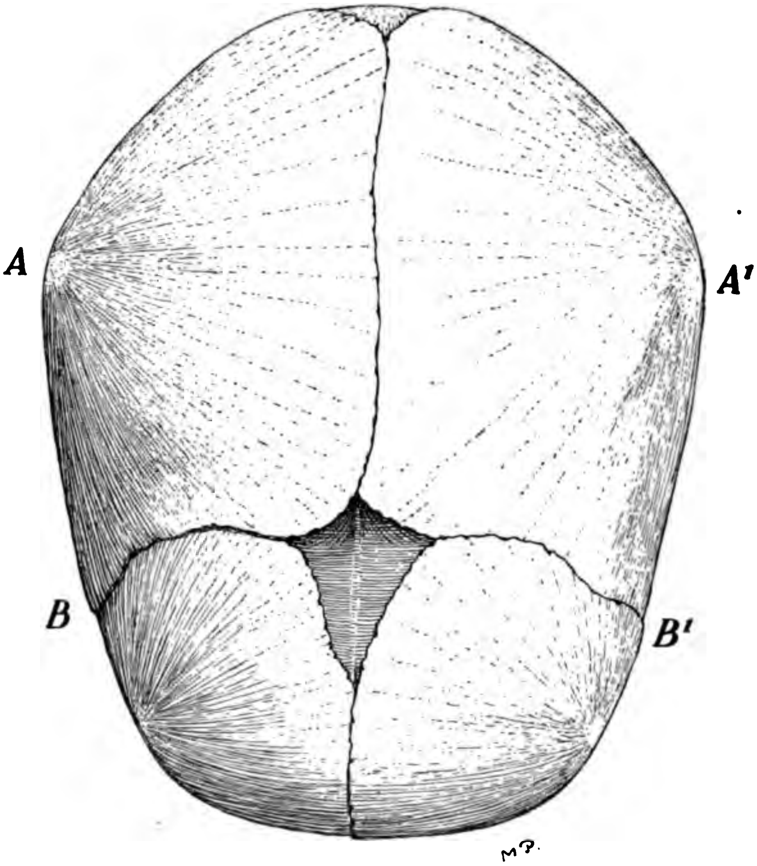


Fetal head, side view. Actual size. *A–B*, occipitomental diameter; *A–C*, occipitofrontal diameter; *D–B*, frontomental diameter; *E*, fonticulus Gasseri anterior; *F*, fonticulus Gasseri posterior.

On the top of the head, between the frontal and the parietal bones, is found a large opening—the *large or anterior fontanelle*—covered only by a fibrous membrane and continuous with the four sutures separating those bones. The distance across the membrane from bone to bone is 1¼ inches, but the anterior triangle is much larger than the posterior, so that the anterior angle becomes smaller and enters deeper between the frontal bones than does the posterior angle between the parietal bones.

The point where the parietal bones meet the occipital is called the *small or posterior fontanelle*, but here is no opening, only a blending of the sagittal and the lambdoidal sutures.

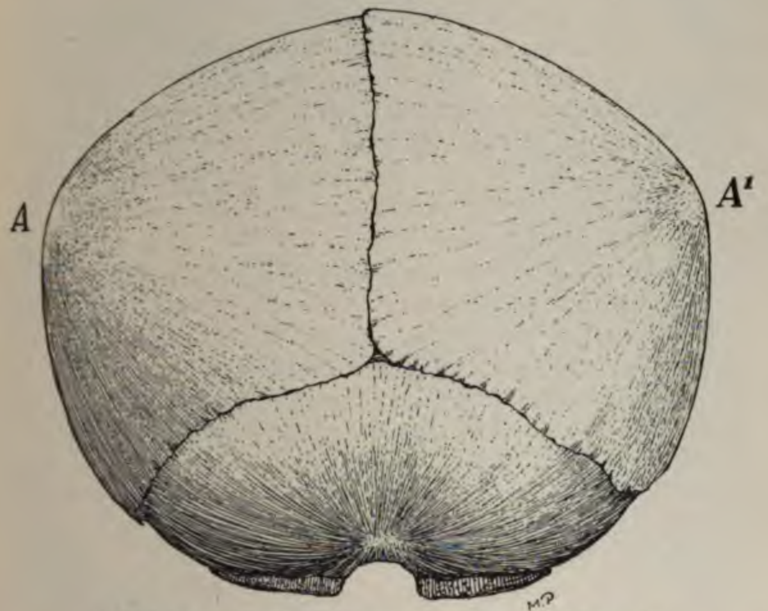
FIG. 198.



Fetal head, from above. Actual size. A-A^1, biparietal diameter; B-B^1, bitemporal diameter.

At the lower posterior angle of the parietal bone, at the junction of the lambdoidal and squamous sutures, and at the lower anterior angle, where the coronal suture strikes the squamous, are lateral fontanelles which have been distinguished as *fonticuli Gasseri.* The last named cannot be felt during labor, but the three others are of great diagnostic value, as will be seen later. The large fontanelle is easily distinguished by its size and shape and its connection with four sutures. The posterior is the one most frequently felt in normal labor and is recognized by the junction of three sutures, one of which leads to the upper end of the occipital bone, which is characterized by its even, smooth, hard, convex surface, while at the posterior lateral fontanelle, which is felt only in the rare ear presentations, and where there also are three sutures, we feel the irregular, rough surface of the mastoid portion of the temporal bone. Between the mastoid portion of the temporal bone and the tabular and condylar portions of the occipital bone are found large triangular openings closed with a fibrous membrane, which are continuous with the suture between the condyloid and squamous part of the temporal, forming a complete hinge, which contributes much to the mobility of the cranial bones.

FIG. 199.



Fetal head, from behind. Actual size. A–A^1, biparietal diameter.

The sutures and fontanelles are not only necessary for the adaptation of the head to the parturient canal, but also of great importance in allowing a healthy development of the child's brain after birth. The large fontanelle seems even to grow in size during the first nine months of the child's life. Then it remains stationary from the ninth to the twelfth month. After that it decreases slowly and is finally closed by the nineteenth or twentieth month.[1]

---

[1] Thomas Morgan Rotch, Pædiatrics, Philadelphia, 1896, p. 64.

Dimensions of the Fetal Head.—In order to understand the mechanism of labor, it is necessary to know the proportions between the dimensions of the fetal head and those of the pelvis studied above. For this purpose certain distances between opposite points, so-called *diameters*, and the *circumference* of the head in certain places are measured.

A. MEDIAN DIAMETERS.—

1. The *occipitomental diameter* (Fig. 197, *A–B*) is the distance between the posterior fontanelle and the middle of the chin, and is 5¼ inches (thirteen and a half centimetres).

2. The *occipitofrontal diameter* (Fig. 197, *A–C*) extends from the posterior fontanelle to the frontal suture at the glabella, and measures 4¾ inches (eleven and three-fourths centimetres).

3. The *suboccipitobregmatic* diameter is taken from the boundary-line between the occiput and the nape of the neck to the centre of the large fontanelle,—that is, the point where the sagittal, frontal, and coronal sutures would intersect one another,—and measures 3¾ inches (nine and one-half centimetres).

4. The *trachelobregmatic* diameter, from the junction of the chin and neck to the centre of the large fontanelle, is also 3¾ inches (nine and one-half centimetres).

5. The *frontomental*, from the highest point of the forehead to the point of the chin, measures 3¼ inches (eight centimetres).

6. The *perpendicular* line from the posterior end of the large fontanelle to the base of the skull at the anterior margin of the foramen measures 3¾ inches (nine and one-half centimetres) and marks the height of the head.

B. The TRANSVERSE DIAMETERS are—

1. The *biparietal* (Figs. 198, *A–A′*, and 199, *A–A′*), from one parietal eminence to the other, measures 3½ inches (nine centimetres).

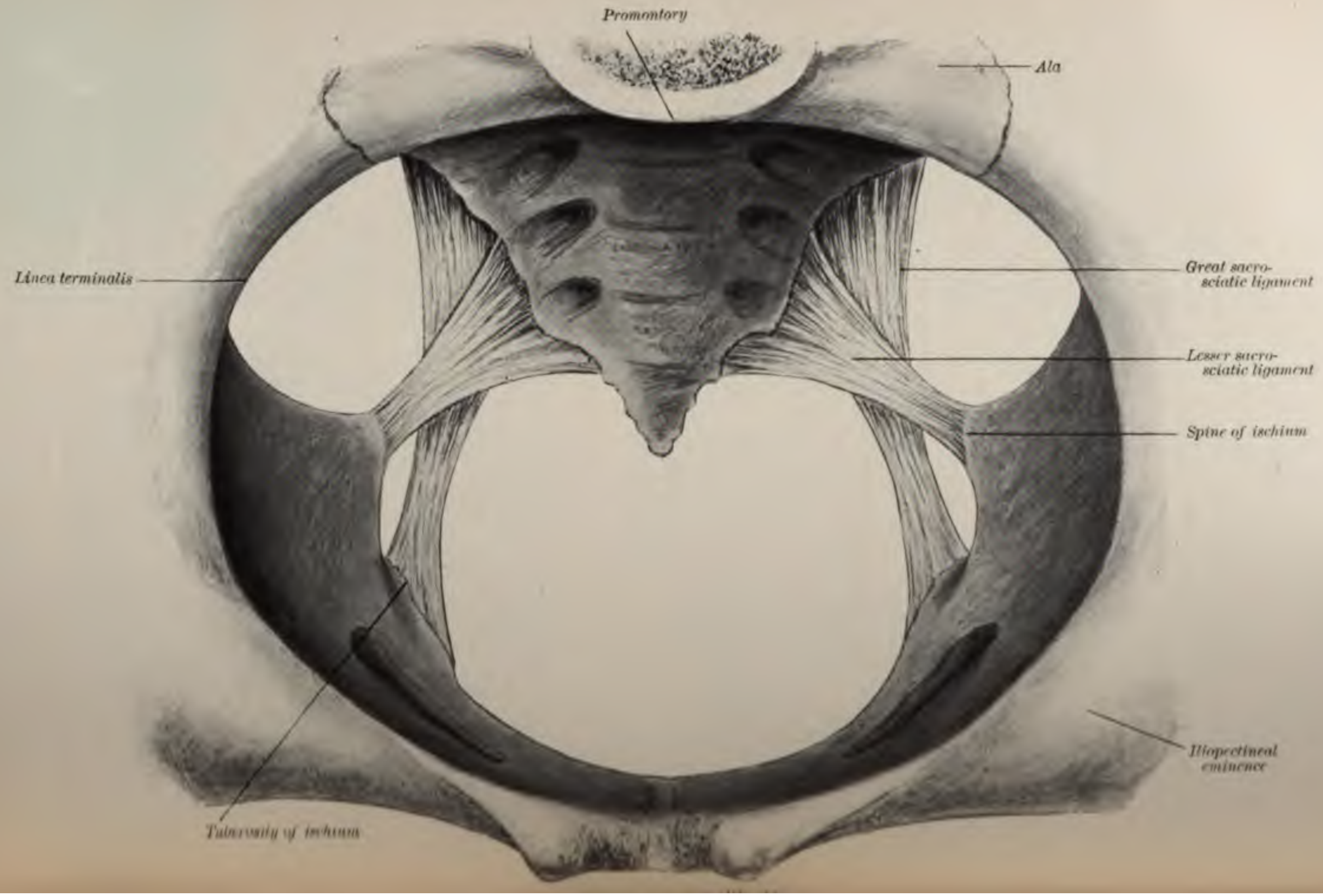
2. The *bitemporal* (Figs. 196, *A–A′*, and 198, *B–B′*) is the longest distance from side to side on the coronal suture, and measures 3 inches (eight centimetres).

The longest diameter, or *maximum diameter*, is not always the occipitomental; the posterior point lies mostly in the sagittal suture a little above the point of the occiput, and sometimes below it on the tabular portion of the occipital bone.

All these measurements are subject to considerable individual variations. The figures given in centimetres represent the averages found by Schroeder. As a rule, the male fœtus has a larger head than the female.

The *occipitomental circumference* is 14 inches, the *occipitofrontal* 12½, and the *suboccipitobregmatic* 11.

The distance from one shoulder to the other—the *bisacromial*


Promontory
Ala
Linea terminalis
Great sacro-sciatic ligament
Lesser sacro-sciatic ligament
Spine of ischium
Iliopectineal eminence
Tuberosity of ischium

diameter—measures 4¾ inches (twelve centimetres), but it is easily reduced to 3¾ inches (nine and one-half centimetres).

The *articulation* between the condyloid portions of the occipital bone and the atlas allows very free movements in an anteroposterior direction, so that the chin may be pressed against the sternum or the occiput against the back, while it allows only a limited lateral excursion and rotation.

On account of the great mobility of the bones, the configuration of the head can change considerably in passing through the pelvic cavity. Its size may also be diminished, the cerebrospinal fluid escaping from the head to the spinal canal and the blood being pressed into the body.

Having represented the actual dimensions of the skull in the four preceding illustrations (Figs. 196–199), the author has in this place added a figure (Fig. 200) representing the actual size of the true pelvis. By comparing it with the former, the reader is enabled to form a clear idea of the mechanical problem of childbirth.

CHAPTER IV.

CHIEF FEATURES OF CHILDBIRTH.

The beginner will, I think, get a clearer idea of the way in which a child is born if, before entering into any details and explanations, I describe the chief features of labor.

First there is a *precursory stage*, extending over about two weeks, during which the uterus sinks deeper down into the pelvis. Consequently the upper part of the abdomen becomes less prominent, an inclined plane takes the place of the uppermost bulging out, and the patient breathes more freely and feels relieved of an uncomfortable pressure in the upper part of the abdomen. But what she gains above she is apt to lose below. The pressure of the head against the brim or the walls of the pelvis interferes with the free circulation of blood in the lower extremities and the pelvis, in consequence of which the veins of the lower extremities, the vulva, and the rectum swell and become varicose. Serum is pressed out through the walls of the veins, causing increased œdema and a corresponding feeling of unwieldiness and impeded facility of movement. Many women suffer a good deal from backache or pains shooting down the thighs, phenomena which doubtless are due to pressure on the nerve-trunks which take their course through the pelvis. Finally labor sets in. The pain in the back becomes stronger and shoots forward around the abdomen to the symphysis. It comes with intervals of about ten minutes and lasts about one minute. The woman becomes restless and wants a pressure on her lumbar region, be it by leaning herself against a fixed object or by having another woman apply her hand to her back. During the pain the uterus may be seen or felt to be harder and to rise up against the anterior abdominal wall. The intervals between pains become gradually shorter and the pain more severe. Often the woman vomits. As a rule, she feels hot and wants fresh air, but off and on she may shiver and have a sensation of cold. There is a mucous discharge from her genitals, which later becomes mixed with blood. After a period often extending over many hours, there is a sudden watery discharge. The pain becomes more severe and makes the woman groan or cry out. Instinctively she bends forward and contracts her abdominal muscles as in the act of defecation, and, as a rule, an evacuation actually takes place from the distended anus. She feels the need of taking hold with her hands of some support that will help her in steadying her body and making her efforts more effective; and for the same purpose she presses her feet against some immovable object. She fills her lungs, holds her breath, and presses downward and backward with all her might, while her face is flushed and often bathed in perspiration. The perineum becomes very much elongated. The rima pudendi begins to gape. The head appears in it during a pain, but recedes during the following interval, thus going to and fro many times, until, finally, under the most severe pain, it is pushed out and rises in front of the vulva, the chin riding over the fourchette. Now there is a short pause in which the bystander may notice that the head rotates, so that the occiput, instead of pointing upward, turns to one side. Next the shoulders appear in the rima pudendi, in the anteroposterior line, and the whole body of the child is pushed out from that of the mother, with which it remains connected only by the umbilical cord. The body of the child is followed by a gush of liquor amnii and blood.

With the expulsion of the child all pain ceases for the time being, shortly to be followed by a new attack, but of a type infinitely less painful than that which accompanied the birth of the child. If he would see the end of the drama of the birth of a human being, the bystander might have to wait for hours, or perhaps till the following day, when the placenta is expelled, followed by the membranes. As a rule, art, therefore, steps in and ends the process in a way to be described hereafter.

CHAPTER V.

THE EXPELLANT FORCES.

We shall now let the light of science in on this scene and begin by a consideration of the expellant forces at work during labor. They are five-fold: (1) the contraction of the body of the uterus and the *uterine ligaments*, (2) the contraction of the diaphragm and the abdominal muscles, (3) the contraction of the pelvic and perineal muscles, (4) the elasticity of the pelvic floor, and (5) gravity. But muscles, again, are made to contract under the impulse of the nervous system, and it is, therefore, proper to ascertain the nature and seat of this influence.

§ 1. **Innervation of the Uterus.**—Both systems—the cerebrospinal and the sympathetic—are concerned in labor. It is mostly an involuntary act, but it is partially under the control of the will, either in furthering or in restraining it. Anatomically nerve-fibres can be followed from the uterus up to the ganglia of the solar and cœliac plexuses, through the pelvic, hypogastric, and aortic plexuses. On the other hand, physiological experiments on animals have shown the presence of a centre for uterine contractions in the medulla, but that the connection with this centre is not indispensable is proved by the fact that bitches in which the spinal cord had been cut and women in whom the conduction had been interrupted by accidental injuries have been observed to have normal labors. What is necessary is the uninterrupted connection between the uterus and the lumbar enlargement of the spinal cord through sympathetic ganglia situated between the second and third lumbar vertebræ.

In examining the causes of labor we have seen that the precise nature of the stimulus that irritates the nervous system so as to bring on labor is not known, and that probably several elements operate in connection with one another. The enormous development of the cervical ganglion during pregnancy makes it likely that it plays a chief *rôle* in this respect. Whatever may be the nature of the irritant, and wherever the irritation takes place, the impulse given is transmitted to the lumbar part of the spinal marrow, where it instigates a motory impulse which through other fibres goes back to the uterus and causes its muscle-bundles to contract.

§ 2. **Labor-pains.**—Labor is the only physiological function which normally is accompanied by pain, and that pain often of the most severe kind. This feature of labor has impressed itself so deeply on the human mind that it has dominated other observations, which, again, has led to the unfortunate confusion of two intrinsically different phenomena—uterine contractions and painful sensations. The poor sufferer is much surprised to hear her medical assistant and devoted friends express the wish that she may have "good pains," the unsophisticated mind finding it difficult to combine the epithet "good" with a condition so hateful as pain, which it is accustomed to look upon as an unmitigated evil. Uterine contraction is a necessary requisite for the expulsion of the fœtus, and in most women this function is accompanied by more or less severe pain. In this respect there obtains, however, the greatest individual differences, some women suffering the tortures of the rack, while others have hardly any real pain, the chief difference being caused by the relative size of the parturient canal and the fœtus, especially the head. Paraplegic women, in whom the conduction to the seat of perception in the brain is interrupted, do not feel any pain; and the same is the case with deeply anæsthetized women. Most women left to themselves experience quite considerable pain, which increases in strength as labor progresses, and comes on with shorter and shorter intervals. In this respect the terminology of the accoucheurs of former days is of interest. They divided labor-pains into *præsagientes* (foreboding), *præparantes* (preparing,—*i.e.*, dilating the os), *propellentes* (propellant,—*i.e.*, pushing the fœtus through the parturient canal), and *conquassantes* (shaking,—*i.e.*, which make the parturient woman tremble all over her body). The moment the child is born all pain ceases for a while, and the poor sufferer feels an inexpressible relief and in most cases no less delight when she hears the baby cry. Physical pain is at an end, the woman is proud of having accomplished the final act of her destination, and maternal love gives her a new interest in life. The pain is greatest while the head passes the vulva, and according to some authors, especially neurologists, it may even cause unconsciousness or momentary insanity, but such cases never have been reported from lying-in hospitals.

The origin of the pain may be sought in compression of the nerve ends embedded in the contracting muscle, in pressure on nerve-trunks being squeezed between the bones of the head and those of the pelvis, and in expansion of the lower uterine segment, the cervix, the vagina, and the vulva, which all have to be stretched enormously in order to allow the fœtus to pass.

The pain is, as a rule, first felt in the lumbar region, from where it later encircles the abdomen along the crest of the ilium and the groins down to the symphysis and external genitals, following the course of the lumbar nerves. Sometimes the pain also shoots down the anterior or posterior surface of the leg, in the track of the crural or the sciatic nerve, and causes cramps in the calves.

If the question is asked why woman should suffer so much in giving birth to her child, the writer is inclined to find the answer in the above-mentioned disturbed equilibrium between the size of the head and that of the pelvis, due to the intellectual evolution of mankind, which has brought about an increased development of the brain without a corresponding increase in the size of the pelvis. Another explanation has been offered to the effect that the pain is present in the interest of the child, as it forces the mother to make deep inspirations and thus furthers the oxygenation of both the maternal and indirectly the fetal blood, which becomes venous by the obstruction to free circulation caused by the compression the fœtus suffers during labor.

The pain which accompanies the loosening and expulsion of the placenta is situated only in the uterus itself, and is comparatively insignificant and of short duration, the parturient canal by this time no longer offering any resistance to so small and soft a body as the afterbirth.

In animals with a bicornute uterus the contraction can be seen to be distinctly peristaltic, beginning at the outer end of the horns. In the human female such a disposition may perhaps be present, but cannot be directly observed. What we do see and feel is that the contraction comes on gradually, reaches an acme, where it lingers for a moment, and then again gradually relaxes. Tracings with the sphygmograph show that the relaxation forms a longer and more slanting line than the contraction. This contraction is entirely independent of will-power and is repeated periodically, at first with intervals of about ten minutes and later of only two or three minutes' duration, the whole contraction, acme, and relaxation together lasting about a minute. When the head is born, the contractions stop for a short time, and after the expulsion of the whole fœtus there is a longer interval. After the loosening and expulsion of the placenta from the uterus, painful uterine contraction ceases.

The contractions are strong enough to numb the accoucheur's hand if during one of them it is in the interior of the uterus, and to form a deep indentation on the parietal bone of the child's head if it meets with unusual resistance at the promontory. By introducing a rubber bag into the uterus and connecting it with a manometer, it has been found that the pressure in ordinary cases corresponds to a column of eighty millimetres of quicksilver, which is equal to a pressure of seventeen pounds; but if there is an unusual resistance, the force may amount to two hundred and fifty millimetres of quicksilver, or fifty-five pounds, the force exercised by the uterus and that by the abdominal pressure being about equal.

We have seen above that at the beginning of labor the uterus is divided into a much larger upper portion which contracts, the walls becoming hard and thick, and a much smaller lower part, the so-called lower uterine segment, which becomes expanded and thinner, and together with the cervix, the vagina, and the vulva forms the canal through which the fœtus is expelled (Figs. 191, 192).

When labor-pains begin, the uterus becomes longer and narrower, and during each pain it is seen how the fundus rises against the anterior abdominal wall, which doubtless is due chiefly to the contraction of the muscular elements of the round ligaments, which increase so much in size during pregnancy, and the contraction of which presses the lower part of the uterus against the pelvic brim in the direction of its axis. The broad ligaments are of minor importance, but contribute to the maintenance of the uterus near the median line of the body.

Next to the uterine contractions in importance as an expellant force is abdominal pressure, which is chiefly exercised by the contraction of the diaphragm, the rectus, pyramidalis, obliquus externus, obliquus internus, transversalis, psoas, and iliacus muscles, but implicates more or less every muscle of the body, as the laryngeal muscles in closing the glottis, those of the upper extremities in seizing fixed objects, those of the lower extremities in pressing the feet against some suitable support, and even those of the back as antagonists to the abdominal muscles. Of the above-named muscles the diaphragm is the only one which is innervated by the sympathetic; all the others get their nerve supply from the cerebrospinal system, and are consequently under control of the will; but that does not prevent involuntary reflexes from taking place in them. And that is just what we find in labor. Abdominal pressure is brought on by reflex action when the ovum is ruptured and the expulsion of the fœtus begins, but the parturient woman has the power at will to increase or restrain this pressure, and thereby indirectly even to make the uterine contractions stronger or weaker. This goes so far that she, within certain limits, can postpone the actual birth of the child,—for instance, till the arrival of persons whom she wishes to be present at her delivery, or on whose assistance during the act she counts. Emotions have also the power of accelerating or retarding labor. While it progresses favorably in the presence of trusted friends, it may become arrested by the entrance of an unsympathetic individual.

The strong levator ani muscle, hugging the curvature of the rectum from behind (Fig. 189) and even sending some loops into the septum between the rectum and the vagina, has the power of directing the fœtus forward towards the opening of the parturient canal; and of no less importance is the elastic resistance offered to the progress of the fœtus in the direction of the expellant force exercised by the uterine contractions and the abdominal pressure. The pelvic floor with its muscles and fasciæ becomes highly distended, and the state of tension in which these parts are becomes itself a force which propels the fœtus in the opposite direction. The small perineal muscles are too weak and too overdistended to have much influence on labor.

Gravity is of minor importance except when the woman is standing up or takes a crouching position during labor. If she lies on her side the fundus tips over so as to be below the exit of the parturient canal, and then the weight of the fœtus, of course, works in opposition to the expellant forces, a condition which the accoucheur, as we later shall see, may turn to profit.

§ 3. **Stages of Labor.**—For convenience labor is divided into three stages,—the opening of the uterus, the expulsion of the child, and the expulsion of the ovum.

THE FIRST STAGE, OR THE STAGE OF DILATATION.—The effect of the contraction of the greater part of the hollow muscle formed by the uterus differs somewhat in primiparæ and pluriparæ. In the former the lower uterine segment and the upper part of the cervix had become expanded towards the end of pregnancy, and need, therefore, not be so after the commencement of labor. The forces which are at work to produce this condition are by French obstetricians aptly distinguished as "*travail insensible*" (Fig. 163). In pluriparæ this work is accomplished by the labor-pains, of which the patient is conscious (Figs. 201, 202, 203). In both classes dilatation continues from above downward till the cervix is all taken up in the cavity of the body, which is technically called the *obliteration of the cervix*, and the os externum is fully dilated, at which time it measures 4½ inches in diameter. During this process the lower uterine segment and the cervix become so elongated that finally they measure 4 inches in

FIG. 201.

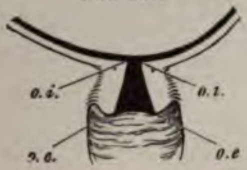


FIG. 202.

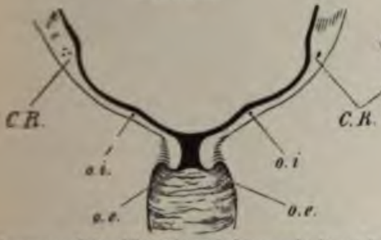


FIG. 203.

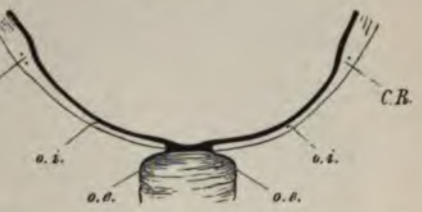
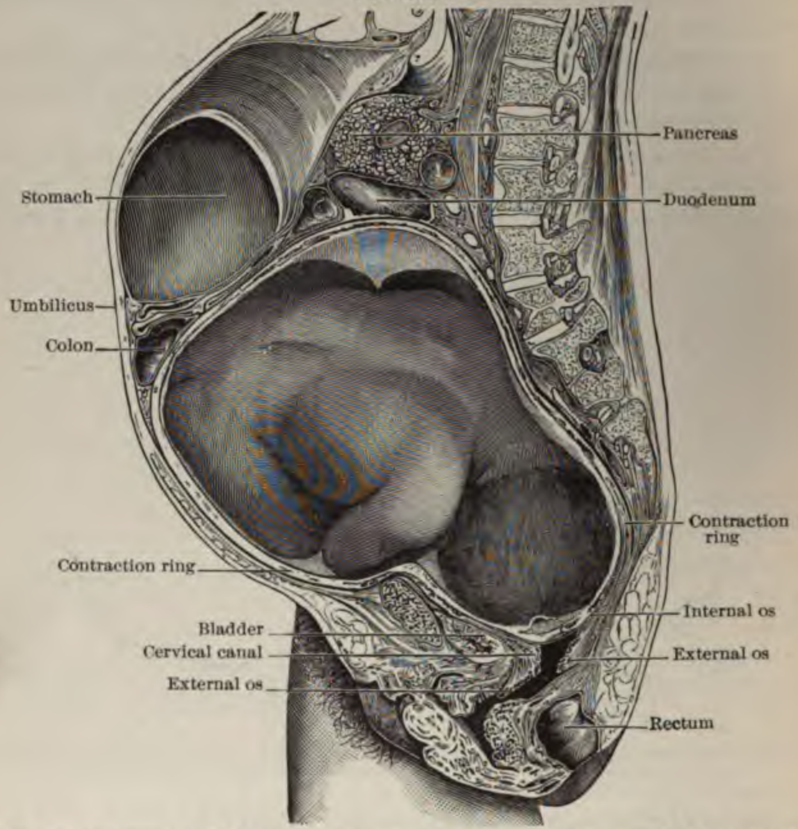


Diagram of the dilatation of the cervix in a pluripara. (Schroeder.) *o.i.*, internal os; *o.e.*, exernal os; *C.R.*, contraction ring. In primiparæ the first stage occurs during pregnancy.

length. The contraction ring, on the contrary, moves upward, so that the expelling part of the uterus becomes shorter, while the passive part becomes longer and wider. The contraction pressing on the ovum and all its contents, a part of the liquor amnii is pressed beyond the head, accumulating between it and the lower pole of the ovum (Fig. 204). During a contraction this bag becomes tense, and during relaxation it hangs down in a limp condition.

FIG. 204.

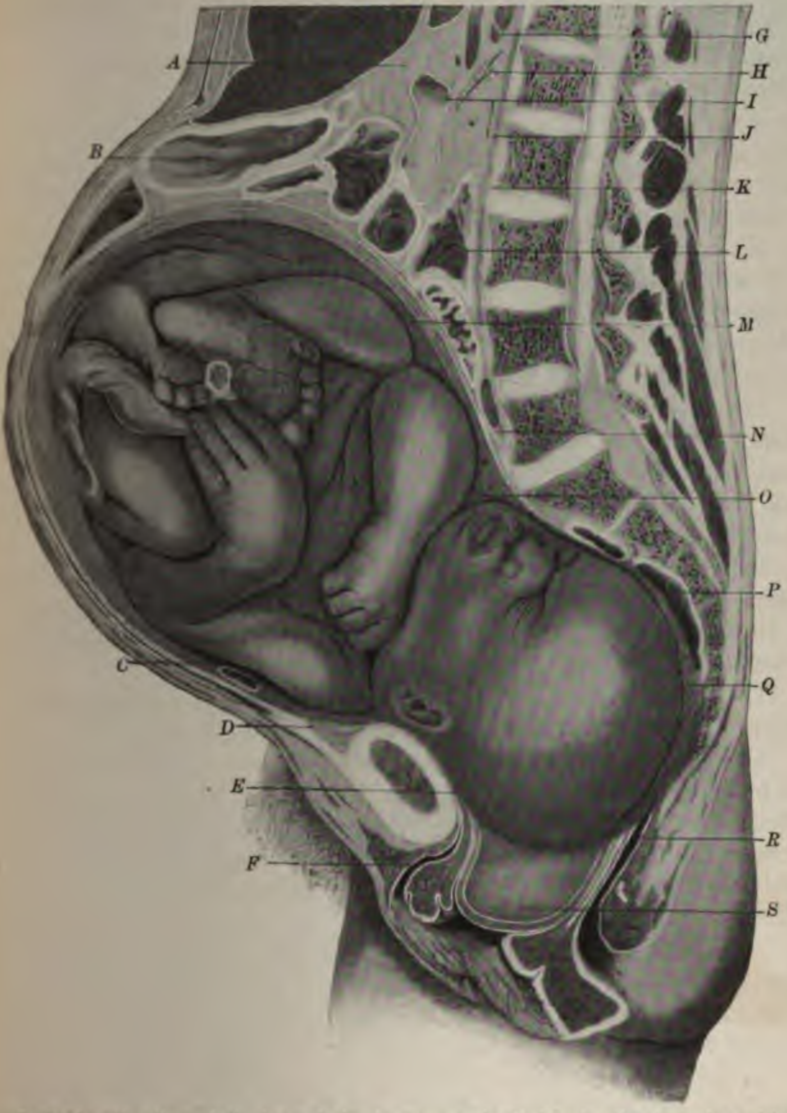


Sagittal section through the body of a quadripara. Opening stage. (Olshausen-Veit.) The cervix is little dilated. Behind the symphysis and the bladder appears the lower uterine segment.

If the head is tightly surrounded by the uterus, as usual in primiparæ, these "*first waters*" may be absent, and the membranes are then in close contact with the skull. When there is such a bag of waters in front of the head, it is an advantage, since during the uterine contractions it becomes tense and serves as a softer dilator for the cervix and os than do the hard bones of the skull.

When the os is fully dilated, "*the waters break*,"—that is, the ovum is ruptured, and that part of the liquor amnii that was situated between the lower end of the ovum and the head escapes, mostly mixed with a little blood. But generally this rupture occurs while there is still left a finger-breadth of cervix, especially in front, and when

FIG. 205.



Sagittal section through the frozen body of a woman who died during the stage of expulsion of the fœtus. (Braune.) *A*, pancreas; *B*, stomach; *C*, os uteri internum; *D*, bladder; *E*, os uteri externum; *F*, urethra; *G*, cœliac artery; *H*, superior mesenteric artery; *I*, vena portæ; *J*, left renal vein; *K*, abdominal aorta; *L*, duodenum; *M*, placenta; *N*, left iliac vein; *O*, os uteri internum; *P*, rectum; *Q*, os uteri externum; *R*, rectum; *S*, liquor amnii.

the os is only three inches in diameter. In other cases the "*bag of waters*" remains unruptured during a large part of the second stage, the stage of expulsion (Fig. 205), and the whole unruptured ovum may be expelled with the child in it. In other cases again that portion of the ovum which surrounds the head of the fœtus is torn off and encompasses it when the child is born. This piece of membrane is called a *caul*, and was supposed to betoken great prosperity for the person born with it and to be an infallible preservative against drowning, as well as to impart the gift of eloquence. During the eighteenth century seamen often gave from fifty to one hundred and fifty dollars for a caul (Century Dictionary).

Sometimes there is a discharge of a watery fluid from the uterus, and still a bag forms. This may be due to an accumulation of a serous fluid between the uterus and the ovum—"*external waters*," or oftener to the occurrence of the rupture not at the lower pole of the ovum, but at a higher level.

When the internal os begins to dilate, the ovum must separate from the uterine wall, and when the external os becomes stretched, small tears take place in its edge, both of which occurrences give rise to a little bleeding, and explain the bloody character of the discharge during the stage of dilatation.

In primiparæ the os becomes so distended that it is felt as a tense sharp edge, while in pluriparæ the rim remains thicker. If the ovum is ruptured prematurely, the external os may again collapse and become smaller than it was before.

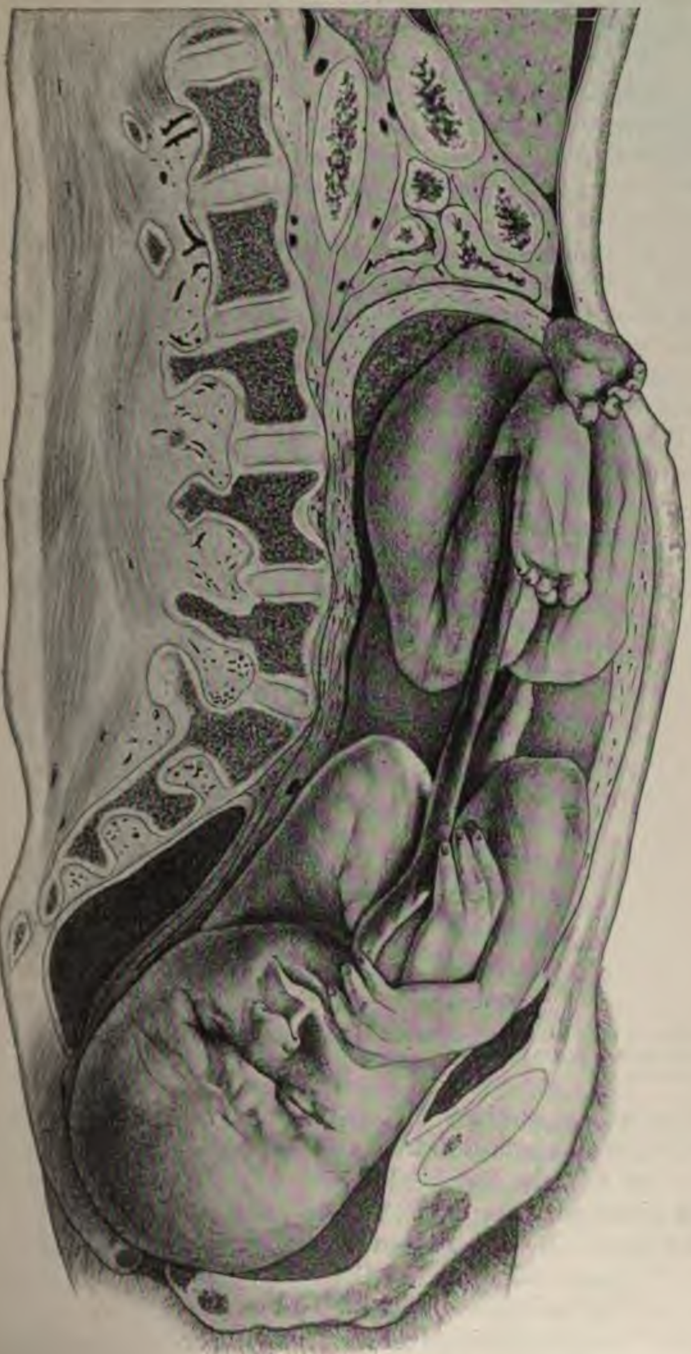
The bladder is gradually drawn up over the symphysis pubis and stripped of its peritoneal covering, as seen in Fig. 205.

The contraction of the uterus and pressure against the brim of the pelvis drive the blood and lymph into the walls of the vagina and vulva, causing hyperæmia and serous infiltration which still further increase the softening of these parts begun during pregnancy. That the large uterine sinuses are emptied by the contraction of the muscular wall can be seen by comparing Braune's plate C, reproduced in Fig. 205, with his plate B, reproduced in Fig. 139. The glands are stimulated to increased action, lubricating the canal through which the fœtus has to pass.

THE SECOND STAGE, OR THE STAGE OF EXPULSION OF THE FŒTUS.—When the external os is fully dilated, the second stage, that of expulsion, theoretically begins; but nature is not bound by our artificial divisions, and often the head has descended considerably into the pelvic cavity before the os is completely dilated, and in primiparæ it is the rule that it does so even during the last months of pregnancy.

When the waters have broken, there follows generally a short interval during which the labor-pains cease, but only to be renewed

FIG. 206.

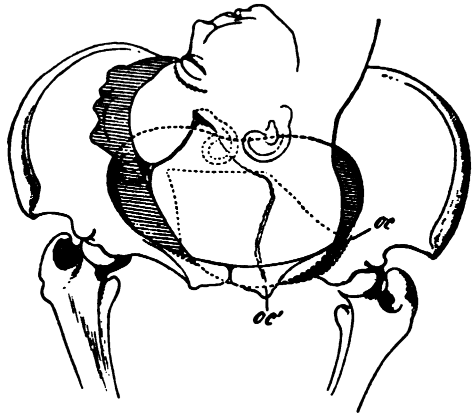


Head pressing on perineum. (Chiari.)

soon after with increased force. They now follow more rapidly upon one another, are more painful, and elicit deeper groans from the sufferer. While in the stage of dilatation she chatted cheerfully with her nurse and friends during the intervals of pain, her whole attention now becomes concentrated on her sufferings.

Gradually the external os is drawn higher up, until it is beyond reach of the examining finger. The contraction ring also moves higher up, and consequently the uterine force is diminished, which can be directly proved by inserting a rubber ball into the rectum of the fœtus in cases of breech presentation and connecting it with a monometer. A new force, that of abdominal pressure, supplements or replaces the uterine contractions. As stated above, this is at first called into action by a reflex from the perineum, but is under control of the cerebrospinal nervous system, so that the patient at will can bear down or hold back the pressure. The perineum becomes enormously distended (Fig. 206), carrying the rima pudendi forward and upward. If the rectum has not been evacuated shortly before by means of an enema, fecal matter is pressed out through the expanded anus, which forms a large open ring an inch or more in diameter. Sometimes there is also an evacuation from the bladder. By separating the labia majora, we may see the head in the vaginal entrance. During each pain it is pushed lower down, and in each interval between pains it recedes again. Next, the vulva begins to gape in a similar way, and, finally, the head rolls out with the occiput in front of the symphysis pubis and the face passing over the fourchette.

FIG. 207.

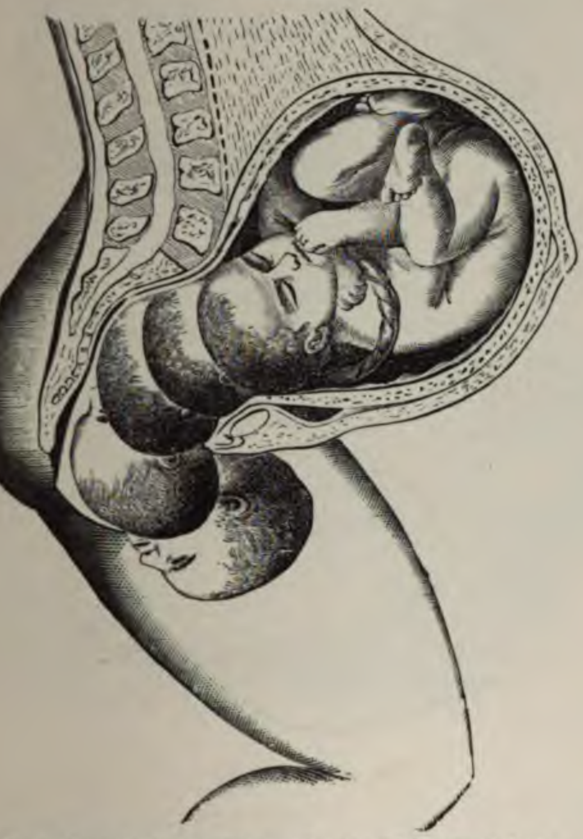


Flexion of head during second stage. (Pinard and Varnier.) The shaded head shows the minor flexion found in pluriparæ and the unshaded the stronger flexion observed in primiparæ. *oc*, *oc'*, occiput.

Then there is a short pause, but soon labor-pains begin again, the shoulders take the place occupied by the head, and the whole body of the fœtus, which now is called the child, is expelled. The hips being retained a little, the obstetrician, as a rule, interferes and pulls out the lower half of the body.

The Mechanism of Labor.—The passage of the head of the fœtus through the pelvic cavity is a mechanical problem governed by the fundamental law that a body moves in the direction where there is least resistance. If the head at the time labor begins is above the brim of the pelvis, it will enter the transverse diameter of the same with its occipitofrontal diameter. The sagittal suture is felt running parallel to the promontory but nearer to it than to the symphysis—the "*obliquity of Naegele*,"—which is due to gravity acting on the uterus, a lesser degree of resistance being offered by the yielding anterior abdominal wall than by the vertebral column behind. Only in wide pelves the head enters in the oblique diameter.

FIG. 208.



Internal rotation and extension. (Tarnier and Chantreuil, l. c.)

FIG. 209.

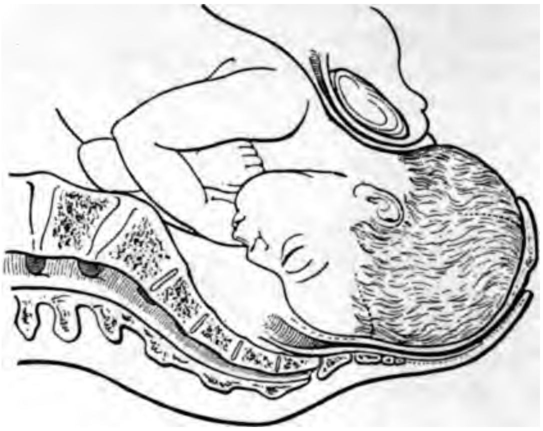


FIG. 210.

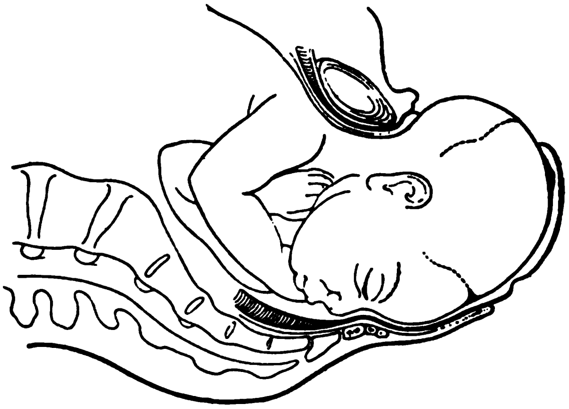
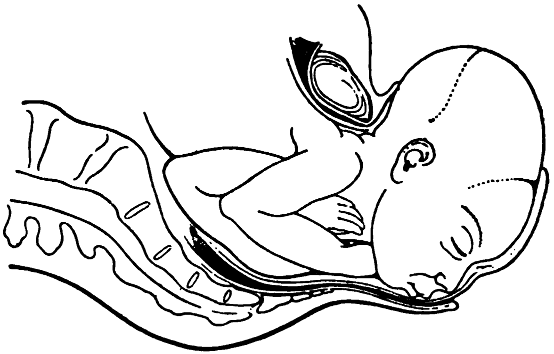


FIG. 211.

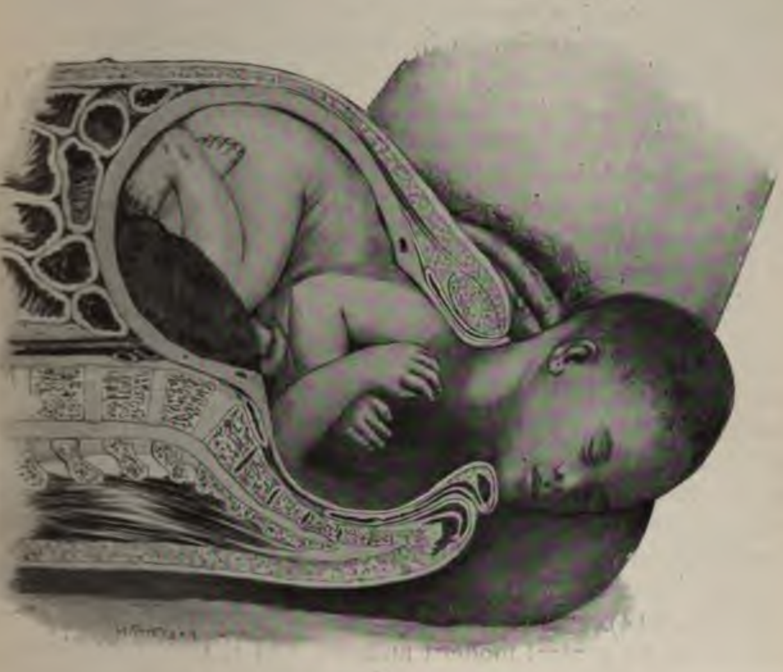


Extension of head and opening of the rima pudendi. (Varnier.)

The head forming a lever, one branch of which—the distance from the occipito-atlantal articulation to the most prominent point of the occiput—is much shorter than the other—the distance between the articulation and the most prominent part of the forehead,—the *descent* is combined with a *flexion* (Fig. 207).

As the head descends more, the occiput turns forward—*internal rotation* (Fig. 208), the cause of which is much debated. In the writer's opinion it is due to the strong resistance offered by the spine of the ischium and the sacrosciatic ligaments, while in front and below there are the hollow smooth surface of the ilium and the ischium, the somewhat yielding obturator membrane, and finally the free outlet presented by the pubic arch. Thus following the line of least resistance the head almost or entirely reaches with its long axis the median line. Since now all resistance ceases in front and pressure continues from behind, and the posterior branch of the lever constituted by the head is shorter than the anterior, the occiput rises outside the maternal body in the direction of the fetal back,—*extension* (Figs. 208–211).

FIG. 212.



External rotation.

When the head is in or near the anteroposterior diameter of the outlet, the shoulders are in or near the transverse diameter of the pelvic cavity, and the same forces and resistance acting on them as formerly on the head, the one that is placed most forward is pushed downward and forward in a curved line, until it passes under the pubic arch, the result of which necessarily is that the occiput turns in the direction which it occupied while passing through the pelvic canal,—*external rotation* (Fig. 212). In other words, in the left occipito-anterior position the small fontanelle describes part of a circle in the direction of the left thigh of the mother, while the right shoulder of the fœtus is turned forward. Exceptionally the left shoulder is ahead of the right in this position, and then the occiput turns in the opposite direction, passing the median line and moving towards the mother's right thigh.

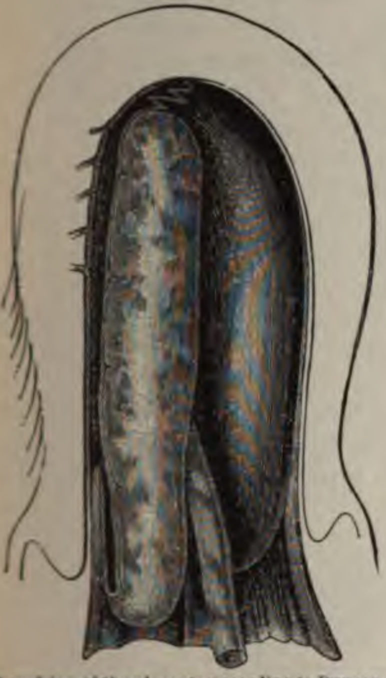
As a rule, the anterior shoulder is born first, but exceptionally it is the posterior that passes the rima pudendi before the other.

The resistance offered by the lower lumbar vertebræ, as well as the contraction ring, prevents the flexed body from following the head in its descent, and consequently the body becomes stretched out.

THE THIRD STAGE, OR THE STAGE OF EXPULSION OF THE AFTER-BIRTH. —When the child is born, uterine contraction and pain cease for a while, but after a pause lasting from five to twenty minutes or longer, new but much less painful contractions follow. By the diminution of the area on which it adheres to the womb, the placenta is thrown off, and, according to Matthews Duncan, rolled together, with the fetal side turned inward, and expelled edgewise, without the accumulation of any blood between it and the placental site (Fig. 213). This is the way in which the placenta is detached if left alone, but if the cord is pulled on, as used to be the mode of delivery, a hæmatoma is formed between the placenta inverted in cup form and the placental site (Fig. 214). This was looked upon as normal by Baudelocque, and is so by several modern authors, and it may exceptionally be found even when no traction has been exercised on the cord.

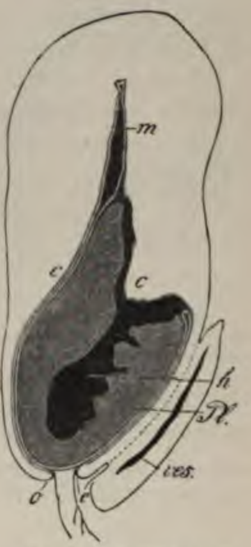
By uterine contraction the placenta is expelled into the vagina and pulls on the membranes, inverting them and detaching them from above downward. It has been asserted that a peculiar crunching sound is produced by the detachment of the placenta. The writer has always looked upon the third stage of labor as fraught with so much danger for the patient that he has not felt justified in watching the natural process of the detachment and expulsion of the after-birth, but interferes as will be described later. What he can state from his personal experience in Cæsarean section is that he did not hear any sound produced by the spontaneous loosening of the placenta, but that a sound much like that heard on pressing a snowball is heard in detaching the membranes from the inside of the uterus. He uses Credé's expression method, and his experience is that the placenta is pushed outside of the genitals edgeways, followed by the inverted membranes forming a bag containing from half a pint to a pint of blood. When this sac is reinverted over the umbilical cord, some blood-clots are found adherent to the maternal surface of the placenta. That the loss of blood is so moderate is due to the compression and contraction of the blood-vessels severed by the detachment of the placenta and the membranes from the inside of the uterus. In nature the placenta would probably only be expelled from the uterus into the vagina, whence it would fall out by its own weight, dragging the membranes after it, when the woman rose to her feet.

FIG. 213.



Expulsion of the placenta according to Duncan. (Charpentier.)

FIG. 214.



Expulsion of the placenta according to Baudelocque. (Pinard.) *o c*, external os; *c c*, contraction ring; *Pl.*, placenta folded together over the maternal surface; *h*, hæmatoma; *ves.*, bladder; *m*, membranes.

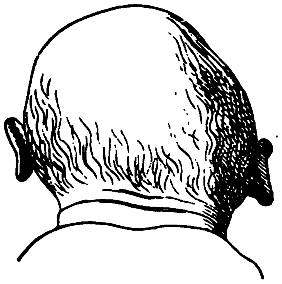
Immediately after the expulsion of the placenta from the uterus this forms a hard ball above the symphysis, but soon the strong contraction relaxes and the fundus mounts during several days to about an inch under the umbilicus or even higher.

§ 4. **Influence of Labor on the Mother.**—During each pain the frequency of the pulse increases in the same ratio as the contraction, and decreases again during relaxation.

The patient's temperature rises a little in the course of labor. Respiration is interrupted during the bearing down, and becomes more rapid during the intervals between pains. The face is flushed during labor, but after the expulsion of the child the congestion to the head ceases, and the sudden anæmia of the brain may cause faintness, vomiting, or perhaps even unconsciousness. Quite frequently the mother feels exhausted and cold, and she may even have a chill, which is no sign of any abnormal condition.

§ 5. **Influence of Labor on the Child.**—After the bag of waters has broken, the effect of the strong uterine contractions is to pack the different parts of the child tightly together, which especially exercises great influence on the head, modifying its form, the so-called *moulding.* The sagittal suture being nearer to the promontory than to the symphysis, pressure bears more strongly on the anterior parietal bone, which becomes more convex, while the posterior becomes more flattened (Fig. 215). The edges of the bones composing the skull are made to overlap one another, the anterior parietal bone being pushed in under the posterior, the occipital and the frontal in under both.

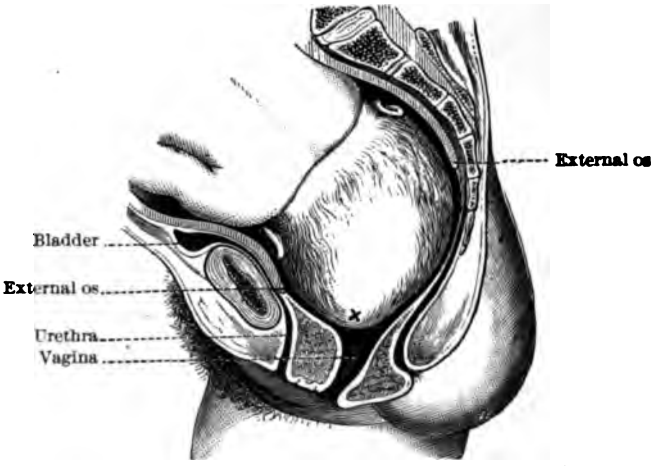
FIG. 215.



Asymmetry of head of child born in right occipito-anterior position. (Olshausen-Veit.)

While the external os is dilating, there is less pressure on that part of the fetal head that occupies the centre than in the circumference, in consequence of which serum is pressed out at the presenting point. It may even contain some blood, owing to capillary ruptures, and forms a swelling called *caput succedaneum*, which is situated on the anterior bregmatic bone and the adjacent part of the occipital bone (Fig. 216). The slower the dilatation is the more this serous

FIG. 216.



Formation of caput succedaneum. (Olshausen-Veit.) ×, centre of swelling.

infiltration will take place. As a rule, it is, therefore, more marked in primiparæ than in multiparæ. A second such swelling may form on a separate spot corresponding to a free central portion, while the surrounding parts are compressed in opening the rima pudendi. These swellings and distortions disappear spontaneously in the course of a few days after the birth of the child.

The fetal heart-beat becomes slower during a labor-pain and faster during the interval, but towards the end of labor the retardation becomes permanent, even during the interval, a phenomenon that probably is due to the increasing venosity of the blood caused by the impeded circulation.

The movements of the child are also much weakened and are hardly felt at all during labor, especially after the rupture of the ovum, when the fœtus becomes subjected to such a pressure and fixation that it hardly can move.

§ 6. **Duration of Labor.**—Labor lasts much longer in primiparæ, in whom the narrower soft parts offer greater resistance, than in pluriparæ. In the former it lasts on an average twenty hours, in the latter twelve, the difference being most marked in the length of the first stage. There are, however, the greatest individual differences, some multiparous women getting through in a single hour, while in some other cases, especially if the waters break early, the process may last for days.

The second stage takes on an average an hour and three-quarters in primiparæ and only one hour in pluriparæ.

The third stage varies very much in length. In the vast majority of cases it takes hours, and may occasionally take over twenty-four hours, as observed in institutions in which this stage is left to nature.

CHAPTER VI.

CAUSE OF RESPIRATION.

In the uterus the child under normal circumstances is in a condition called *apnœa*. The blood being oxidized in the placenta, it contains oxygen enough for all purposes, and there is no stimulus that impels the fœtus to respire. Almost immediately after its birth, the child fills its lungs with air and cries, as if it were in pain, and if the shoulders are arrested, we may even see the purple-colored head make fruitless attempts at breathing. Much ingenuity has been bestowed upon the question, What makes the child respire? Some cynic has said that the child cries because it is sorry to enter this miserable world. The chief cause is doubtless to be sought in a change in the blood by which the amount of oxygen circulating in it is diminished. If the placenta is detached, the source of oxygen is cut off altogether, but respiration often begins while the placenta is not only in the uterus, but even when it to all appearances is not detached. Perhaps the contractions of the uterus deprive it of a large part of its blood, as when by manual pressure we expel the water from a sponge. The purple, almost blue, color of the face of the child arrested in front of the parturient canal, bears witness to a strong passive congestion to the head, which may stimulate the centre of respiration to activity. The impression of the comparatively cold air meeting the child in the outer world does not seem to be of marked importance, since children begin to breathe even if experimentally they are born into water of the temperature of the body. That the low temperature of the ambient medium and other irritants have, however, some influence appears clearly by the effect of measures used to induce respiration in asphyctic children. One of these is to plunge the child alternately into hot and ice-cold water, and the writer has invariably noticed that the first cry is uttered while the child is in the cold water. When first the centre of respiration in the medulla is stimulated to action, the impulse goes out through the pneumogastric nerve to the lungs and through other cerebral and spinal nerves to all the muscles concerned in inspiration and expiration.

CHAPTER VII.

CONDUCT OF NORMAL LABOR.

When engaged to attend a woman in her confinement, it is proper for the obstetrician to make external and internal examinations, as described above (pp. 107–120), to give advice in regard to dress and regimen during pregnancy (pp. 126–128), if necessary to prescribe for constipation or anæmia, direct the patient to send her urine for examination once a month, and to report to him as soon as she notices anything abnormal in her functions.

Materials Needed.—About two weeks before the expected day of confinement the writer orders the following objects to be provided for the occasion:

Lysol, ℥iv;
Alcohol, ℥viii;
Thick gutta-perch tissue, 1 yard;
Chloroform, ℥ii;
Fluid extract of ergot, ℥i;
Absorbent cotton, 1 pound;
Whiskey or brandy;
Unbleached muslin, one yard wide, 6 yards;
Safety-pins, 1 dozen large and 1 dozen small;

A douche-pan (Fig. 217);

A fountain syringe (Fig. 218);

A rubber sheet 3 by 1½ yards;

A piece of the same material 1½ by 1 yard (where economy is an object, so-called white enamel, a kind of thin oil-cloth used for table-covers and inexpensive, may be substituted for both);

6 small unbleached muslin quilts, about a yard square, found in the dry-goods stores, or a similar clean absorbent material (the quilts should be washed before using them);

A baby bath-tub;

A large dish-pan;

3 basins;

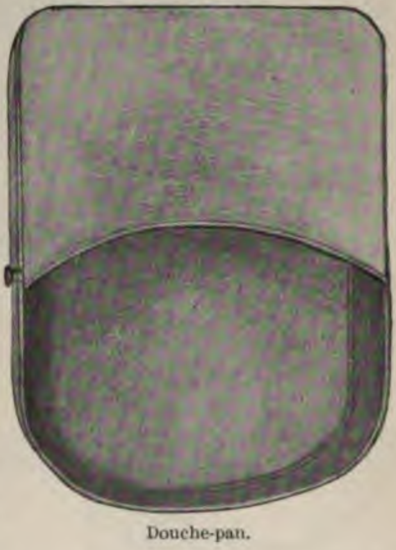
3 pitchers;

Ice;

Hot and cold water.

In country practice and in city practice among the poor the physician must carry everything with him and often has to put up with less numerous utensils and materials, but he should at least insist on some clean sheets, a large dish-pan, and hot and cold water. For that kind of practice some physicians carry in their satchel an inflatable rubber cushion with apron (Fig. 219). If desired, this can, however, easily be improvised by merely carrying a piece of sheet-rubber, one end of which is drawn around a sheet rolled together like a sausage, and bent so as to form the three sides of a square or three-fourths of a circle.

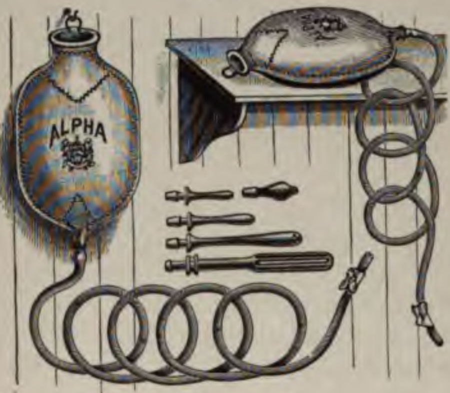
FIG. 217.



Douche-pan.

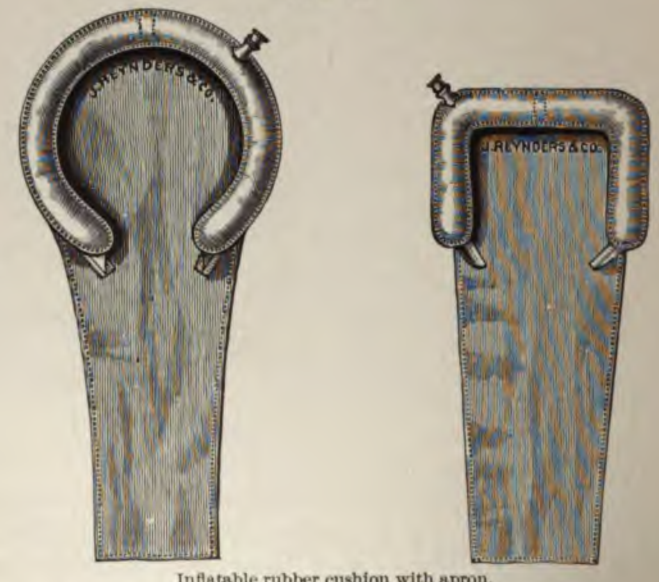
Assistants.—The doctor should also secure proper assistance. If the patient can afford it, a trained nurse who has had a full course in a lying-in hospital is a great comfort to her and an invaluable help to the physician. Sometimes we have, however, to be satisfied with one of those cheap so-called nurses who, without having learned anything, make a living by attending to sick persons and lying-in women; and often there is no nurse at all. Under such circumstances it is particularly important to inform the patient that frequently the help of three persons besides the accoucheur may be needed. One of them should be the husband, if there is one. I have always found that nobody has so soothing and comforting an influence on the parturient woman as the author of her trouble, and it is certainly the least he can do for her to witness her sufferings. Woe to those thin-blooded, pale-faced, selfish men who declare they cannot see blood, and who keep away from home or retire to another room in order not to hear the cries of their wives in labor. They are unworthy of a woman's love and unfit for the stern duties of fatherhood. The second person may be the patient's mother, if she is not too old, too nervous, or too sentimental. She is a living proof to the sufferer that one may go through such an ordeal and still be alive. The third should be some kind-hearted friend. But these persons should only come when needed, and all others should be kept away. They only make trouble, consume the oxygen of the air in the room, and often make the patient nervous by their exaggerated sympathy or, still worse, by relating all they have gone through themselves or witnessed in others

Fig. 218.



Fountain syringe.

Fig. 219.

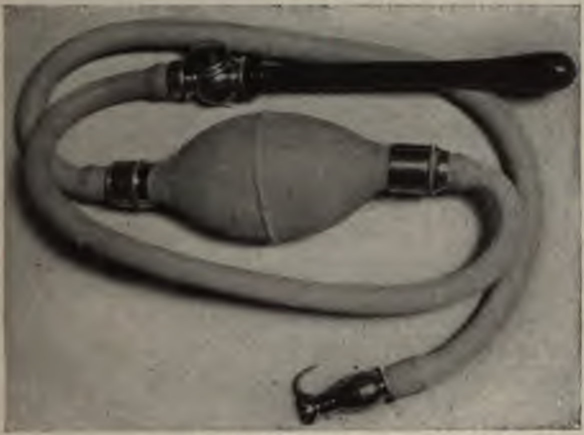

J. REYNDERS & CO.
J. REYNDERS & CO.

Inflatable rubber cushion with apron.

on similar occasions. Ordinarily the doctor has more real assistance from an experienced nurse than from the three other persons together.

Choice of Room.—If we have the choice, we should choose a large, well-ventilated room with a good light, a cool one in summer-time and a warm one in winter, preferably with morning sun. We must also be guided somewhat in our choice by the disposition of gas-brackets or electric lamps. Most confinements take place at night, and a good light not only is a comfort, but also may be an important factor in case of complications calling for special interference. In the hut of the poor there may be only a tallow candle or a kerosene-oil lamp; but the doctor should, whenever possible, secure sufficient illumination for the proper performance of his work.

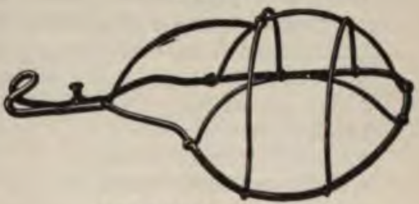
FIG. 220.



Bulb and valve syringe.

Whenever a physician is called to a pregnant woman, he should repair immediately to her residence. As a rule, especially in the case of a primipara, he will be called long before his services are needed, but it is his duty to satisfy himself at once about her condition. If he finds that labor has not begun or is just commencing, he may leave his patient and attend to other work. It is the writer's practice to come again about every two hours and to stay when the os is dilated to the size of a fifty-cent piece.

FIG. 221.



Esmarch's chloroform-mask.

The Obstetrical Bag.—I shall now frankly tell what I, who am called chiefly in consultation when some difficulty arises, and when I am expected in most cases to perform an operation, carry in my satchel.

First a few words about the bag itself. It is an alligator satchel, sixteen inches long, eight inches high, and ten inches wide when open. In one side is a pocket running the full length of the bag; on the other I have had a movable leather strip put into cuts in the leather lining, one and one-half inches apart. Thus a row of eight compartments is formed for bottles, most of them containing one fluidounce, but that with chloroform having the capacity of two ounces.

In this satchel I carry:

A stethoscope;
A Davidson's bulb and valve syringe (Fig. 220);
A hypodermic syringe, with tablets of morphine and atropine and bottles containing tincture of digitalis, spiritus glonoini, and a solution of sulphate of strychnine;
Garrigues's intra-uterine tube, with rubber tubing for establishing connection between the tube and the syringe;
A nail-brush;
A pelvimeter;
A tape-measure;
A set of Barnes's cervical dilators, with metal attachment fitting the syringe and having a stopcock;
A colpeurynter;
Arthur Müller's modification of Champetier de Ribes's metreurynter;
Arthur Müller's cervical dilator;
A ball of the thickest knitting-cotton;
Esmarch's chloroform-mask (Fig. 221);
Garrigues's transfusion and infusion apparatus;
Linen tape, one-fourth inch wide, for fillets;
Olivier's fillet-carrier;
Two flexible English bougies (No. 10), for induction of premature labor;
A flexible English catheter (No. 6), for the larynx of the child;
A soft-rubber catheter (No. 9), for the bladder of the mother;
A flexible metal male catheter;
A repositor, for the prolapsed cord;
A long, curved intra-uterine forceps;
Two long artery-forceps;
A pair of cervical scissors;
A sharp-pointed bistoury;
A probe-pointed bistoury;
Simpson's axis-traction forceps;
Simpson's cranioclast;
Thomas's perforator;
Naegele's perforator;
Symphyseotomy instruments: Galbati's falcetta, convex and concave bistoury, and chain saw;
A placenta-forceps;

A large dull wire curette ;
Large curved needles ;
A needle-holder ;
Aseptic silkworm gut and silk ;
A spring baby scale.

With this instrumentarium I am prepared for all operations except cephalotripsy, the cephalotribe being hardly ever needed and being too long for the satchel and too heavy to carry around.

In the bottles I have :

1. Tinctura saponis viridis ;
2. Lysol ;
3. Alcohol, 95 per cent. ;
4. Aqua ammoniæ fortior ;
5. Extractum ergotæ fluidum ;
6. Liquor ferri chloridi ;
7. Chloroform ;
8. Spiritus ætheris compositus.

The satchel with all its contents weighs only thirteen and a half pounds.

The above list represents the outfit of a specialist. The general practitioner needs much fewer instruments, but a nail-brush, a syringe, an obstetric forceps, needles, needle-holder, sewing materials, and ergot ought always to be in his satchel.

Ideas about what is necessary differ much. In a recent journal article an enthusiastic disinfecter asks the patient to provide an aseptic outfit costing from four to thirty dollars, and recommends the physician to carry an obstetric case weighing twenty-five pounds and costing so much that the price is not even mentioned. I doubt that many young doctors at the stage when expenses are many and receipts few will be willing to follow this recommendation, and that they will have many patients with so long a purse that they safely can propose so expensive a preparation for an event which forms part of woman's normal life. It is much more likely that the practitioner will have to carry all he needs in his satchel, and then it is important to him that this does not weigh too heavily either in his hand or in his accounts. If we ask too much, we shall not obtain anything. Most general practitioners—not to speak of midwives—are far from taking the most indispensable antiseptic precautions. I think, therefore, that we had better try to convince them of the value of an antiseptic treatment which can be carried out in nearly every house and at very small cost. To ask for a whole aseptic outfit seems to me inexpedient and even superfluous. It may seem very simple only to ask for a thermometer registering 200° F. in order to be sure to have heat enough to sterilize pads in the oven of the kitchen range and on the other hand not to scorch them, but such a thermometer is not found in common dwellings, most people would not know how to read it, they would be likely to break it, and the doctor has not time to pass an hour in the kitchen for sterilization purposes. In private practice the writer thinks *we should chiefly be satisfied with antiseptic obstetrics* and not aim at an asepsis which gives endless trouble, which most of the time will be found impossible, and which is not necessary for perfectly satisfactory results. Fortunately, an accouchement does not require the same precautions as a hysterectomy. Patients whom we strongly recommend for the latter to repair to a hospital, with all its perfect, but costly, paraphernalia and skilled assistants, want to give birth to their children in their own homes, in their common beds, and with a reasonable outlay of money. There is, of course, no objection to the boiling of instruments, and it is not necessary to do so for an hour. If a handful of washing-soda, which is found in nearly every house, is added to the water, a pair of forceps can be disinfected in two minutes. But to have sterilized towels, sheets, and aprons is not feasible in a private house under ordinary circumstances.

When the physician answers a call to a labor case, he should take his satchel along, but if possible he should leave it in another room in order not to scare the patient. He should avoid any appearance of hurry; and, unless there are signs of urgency, he should first of all say a few kind words to the patient, and do everything in his power to concilitate her friends and nurse. It may be of vital importance to avoid any friction among the participants in the treatment. Even if the mother seems foolish and the nurse ignorant, their confidence and good graces must be won, for there is no telling what may happen in a confinement case. When it is easy, it is the easiest thing in the world; but when difficult, it is one of the most difficult problems to deal with; and we may need the help of every one in the room.

Preparation of the Bed.—If we have the choice, a single bed is much more convenient for obstetric purposes than a double one. Under all circumstances it should be placed so as to be accessible from at least three sides. The large above-mentioned sheet of rubber or oil-cloth is pinned immediately to the mattress, overlapping the outer edge of it,—that is to say, that turned to the room and away from the nearest wall. Next the common white sheet is spread over the whole bed and tucked in as usual. Next the smaller sheet of rubber or oil-cloth is put loose over the middle of the sheet, near to the outer edge. On that is laid a folded quilt or a couple of small quilts, and on top of that a folded clean sheet.

Preparation of the Patient.—The patient should wear a woollen or merino vest, a night-gown, and woollen stockings going up over the knees, but no drawers. The night-gown should be folded up under her back so as to prevent it from getting soiled. Experienced nurses know also how to pin a sheet to it as a further protection, and leaving the whole abdomen and back from the ribs downward uncovered. The patient should be covered with a sheet and enough blankets or quilts to feel comfortably warm. Feather-beds, unless in the shape of quilts, are inconvenient, owing to their bulk and weight. When circumstances allow it, it is well to let the patient at the beginning of labor take a general warm bath and scrub her with soap, in order to have the skin in as good condition as possible in regard to cleanliness and perspiration. If labor has progressed so far that there is considerable dilatation of the os, especially in a multipara with a gaping vulva, it is better not to give a bath, as the water might enter the genital canal and become a source of infection.

An enemā of soapsuds should be given. This may conveniently be prepared by stirring a cake of any kind of soap with a tablespoon in a pitcher of lukewarm water until a good lather forms. It is best to administer it with a Davidson's bulb and valve syringe, as the interrupted jets contribute to call forth a movement of the bowels. The object in giving this enema is twofold: first, we thereby avoid the disgusting and sometimes even dangerous evacuation of fæces into the bed and over the accoucheur's hands, and, secondly, we give more room for the fœtus to pass the pelvis.

The patient should be near the right edge of the bed, so as to facilitate all movements of the accoucheur's right hand.

Abdominal Palpation.—We have above (pp. 107–120) given full information as to how a complete physical examination of a pregnant woman should be made. During labor there are three ways of seeking the information needed in order to be able to give proper assistance to the parturient woman,—abdominal palpation, auscultation, and vaginal examination. By abdominal palpation we ascertain, first of all, if she is pregnant; secondly, we learn whether it is a longitudinal or a cross presentation; thirdly, we make out where the head is; fourthly, we map out the whole child, calculating its size and forming an idea whether the back is turned forward or backward, to the left or to the right side of the patient; and, finally, we judge of the size of the head and its degree of engagement in the pelvic cavity. In making his palpation the accoucheur should also be on the lookout for the more common abnormalities, such as twins or abdominal tumors.

By means of the stethoscope we find the locality of the greatest intensity of the fetal heart-sound, and may also listen for the uterine souffle and the umbilical-cord sound, although they are of minor practical importance. The accoucheur should first apply his stethoscope about two inches to the left of and below the umbilicus, which is the most common place for the heart-sound to be heard, and, as a rule, corresponds to the left occipito-anterior position and vertex presentation.

Disinfection.—Before the physician proceeds any farther in his examination, he and the patient must be especially prepared in regard to the possibility of infection, and if the doctor will remember in every single case that his patient's health and life and his own reputation are at stake, he will pay the closest attention to the performance of this part of his duty.

The abdomen, thighs, and buttocks of the patient are washed with soap and hot water, using a towel or a piece of muslin. The external genitals, inclusive of the inside of the vulva, are washed in a similar way, using absorbent cotton. After that, all these parts are gone over again with lysol solution.

The doctor should pull off his coat, vest, collar, necktie, and cuffs, and turn up the sleeves of his shirt and undershirt above the elbows. A folded sheet should be pinned around his body and to his suspenders, reaching from his armpits to his feet. Next he should scrub his hands and arms with soap and as hot water as he can bear for three minutes, using his own nail-brush, and, having rinsed them, he should scrape his nails with a steel nail-scraper, removing every vestige of dirt that still may remain under them. Thereafter he should scrub his hands and arms for three minutes more in a one per cent. solution of lysol (a teaspoonful for each pint of water), and, finally, he should wash them with alcohol and absorbent cotton. In thus disinfecting his hands he should take particular care to clean the furrow at the base and sides of the nails and the space under their tips.

Only when all this has been attended to are physician and patient in a fit condition for a vaginal examination. The patient should lie on her back, near the edge of the bed; the accoucheur should sit on a chair close up to the bed. The nurse should lift the bedclothes, so as to afford free access to the genitals without touching any other object. The doctor should open the vulva widely with the left hand and introduce the right index-finger through the vagina to the os. He notices the position and length of the cervix, the size of the os, whether the ovum is ruptured or not, what the presentation is, and perhaps the position. He feels whether the head is engaged, and if so how deep it dips into the pelvic canal, in which respect the symphysis pubis, the iliopectineal line, the spine of the ischium, and the tip of the coccyx are used as landmarks. By placing the finger on the head and seizing it above the symphysis between the thumb and index-finger of the left hand, he can judge accurately of its size. He should not enter the cervical canal. Only in abnormal cases there may be call for internal pelvimetry with two fingers (p. 116) or even an examination with "half the hand,"—that is, with all four fingers and the metacarpus up to the thumb. In normal cases he should be satisfied with what he feels through the cervix and lower uterine segment and in the open os. He feels for the posterior fontanelle and the sagittal suture, the direction of which at once indicates the position of the head in the pelvis. In the first position the posterior fontanelle is felt pointing forward and to the left, and the sagittal suture running backward in the right oblique diameter. In the second position the small fontanelle points forward and to the right, and the sagittal suture follows the left oblique diameter of the pelvis.

Some obstetricians condemn the internal examination altogether, and there is no doubt that infection chiefly takes place in consequence of this examination. In preantiseptic times it was a well-known fact that street-births took a particularly smooth and uneventful course. The patient, being suddenly taken in labor, and giving birth to her child without the help of any midwife or doctor, was sheltered from the chief cause of puerperal disease. But with our present knowledge and means of disinfection, the dangers of infection have been minimized, and, on the other hand, the internal examination offers so valuable information about the progress of labor, presentation, position, and abnormalities calling for interference, that, in the opinion of the writer, the advantages outweigh the danger. But since it is impossible to produce absolute sterilization of the skin, and since there may be pathogenic germs in the vulva and vagina, the rules given above should be carefully followed, and furthermore internal examinations should be restricted as much as possible,—that is, they should only be repeated with one or two hours' interval.

In cases in which it becomes necessary often to enter the vagina, it would be too troublesome to go through the whole process of disinfection every time, but a basin with lysol (one per cent.) should constantly be within reach and the accoucheur should immerse his hands in the fluid and spread the labia wide apart before inserting his finger.

In order to avoid spoiling the carpet, it is well to direct the patient to provide an old rug, canvas, or similar substance, to be placed on the floor in front of the bed.

It is a delicate point to decide what the physician should do if besides a patient who expects to be confined he has others suffering from diseases which are catching and particularly dangerous for a parturient woman, such as diphtheria, erysipelas, or pelvic inflammation after confinement. In preantiseptic times it was the rule to place the patient to be confined under the care of another physician. In lying-in hospitals, where in olden times so-called epidemics raged that cost many lives and often necessitated the temporary closure of the hospital, and where, on the other hand, there is, as a rule, an abundance of space and help, any patient taken seriously ill should be isolated and have a special accoucheur and special nurses, who are not allowed to enter the wards occupied by waiting women or normal puerperal cases. In polyclinic service,—that is, where doctors are sent from a hospital to treat patients in their own homes, —a similar system is followed. But in private practice it is very inconvenient and often impossible to adopt these measures. There may be only one physician in the place, and in a time like ours, when the profession complains so bitterly of the difficulty in making a living, it would indeed be a hardship if the doctor engaged to assist a woman in her confinement were prevented from answering her call because he had a case of contagious disease in his practice. But under such special circumstances he should take particular precautions. If possible, he should change his clothes after having seen the contagious case, and even take an entire bath with two drachms of corrosive sublimate, and wash his hair with a saturated solution of boric acid; and he should at all events disinfect his hands and arms with more than usual care. Before using lysol and alcohol, it is well to use chlorine, which can easily be obtained by taking a little chlorinated lime and carbonate of potassium in the hollow of the hand and making a paste of them with water, which paste is rubbed all over the parts that are to come in contact with the genitals of the patient. After that they may be scrubbed with a solution of bichloride of mercury (1 : 1000). If any odor clings to the hands, they should be washed with oil of turpentine. The time consumed in disinfection should be prolonged to ten minutes. But as in spite of all these antiseptic measures it is impossible fully to disinfect the hands, it is advisable to cover them with a pair of those thin rubber gloves which are now extensively used by surgeons.

In this connection it is also well to know that contact with dead bodies is particularly dangerous. A man who takes obstetric cases or performs abdominal operations had better abstain from making autopsies. As we shall see later, it was just the effect of cadaver poison on parturient women which led to the understanding of the cause of puerperal fever and to the discovery of its prophylaxis.

If feasible, it is also better to see parturient women and well puerperæ before attending to other patients.

After the accoucheur has made his examinations, he will in most cases be asked when the child will be born; but he should refrain from assuming the part of a prophet, as it is impossible to foretell how slowly or rapidly labor will progress and what complications may arise. It is, however, proper to assure the patient that everything is normal, and, if she is a primipara without experience, also to tell her not to expect to be through soon, as labor always is a slow

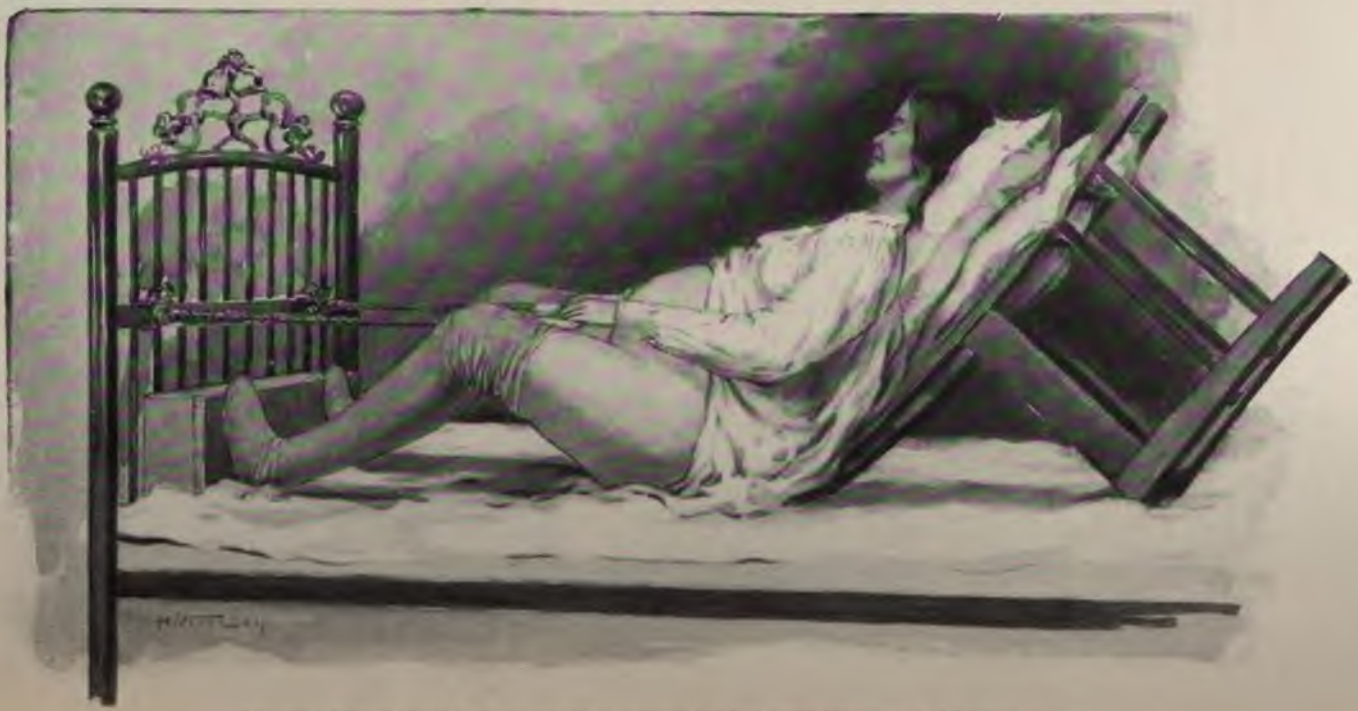


FIG. 222.—Patient raised on inverted chair, pressing her feet against footstool and pulling on rope.

process, especially the first time. It would only make her impatient if she expected to be delivered in a few minutes and had to face many hours of suffering.

Position of the Patient in the Three Stages.[1]—During the first stage, if the waters have not broken prematurely, the patient may be allowed to be up, to walk about, to sit down, to lean against some person or object,—in fact, to do as she likes. When the os is nearly dilated or if the ovum is ruptured, she should stay in bed and lie on her back, but not too low, as she has more power to bear down when the upper half of her body is somewhat elevated. Sometimes it is a good plan even to take a strong chair and place it in the bed under the patient, padding it with pillows (Fig. 222).

The nurse may take her hands and pull on them while the patient bears down, thus affording a solid support during labor-pains.

Still greater force can be developed if the patient pulls on a rope fastened to the lower end of the bed. For this purpose a common clothes-line may be used, but that part of which the patient takes hold should be padded by winding around it a towel, which is tied at both ends.

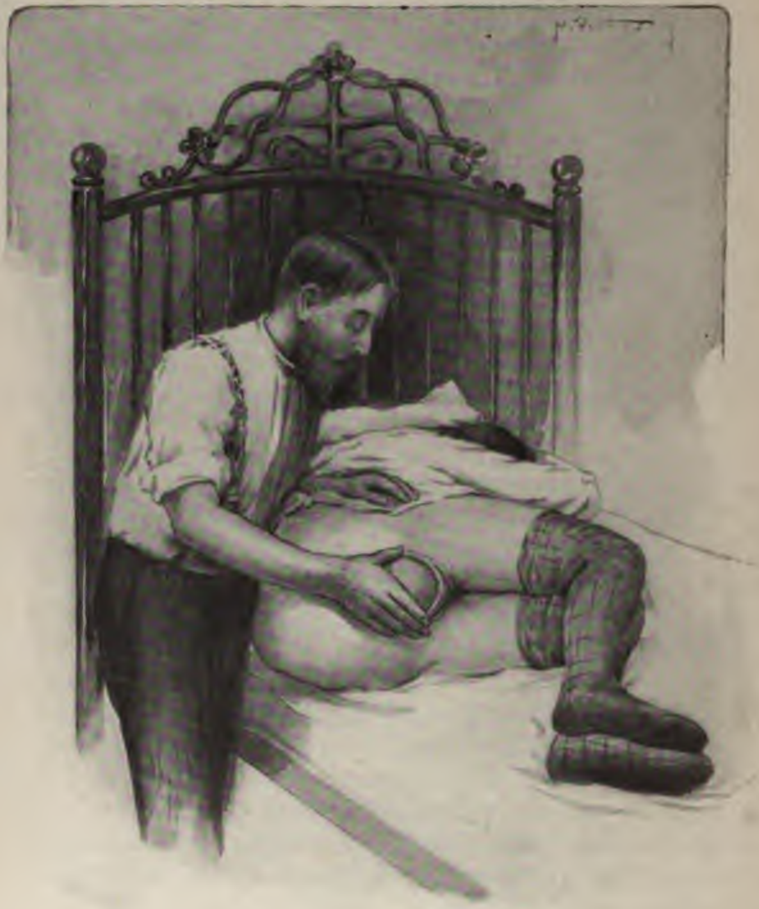
In order to give a solid support to the feet, a board—for instance, one of those lap-boards found in most houses—should be tied to the lower end of the bedstead, if it is composed of metal bars, and a footstool should be placed between the board and the feet of the patient.

When the head distends the rima pudendi, the writer turns the patient on her left side with bent knees, and deprives her of all help in bearing down (Fig. 223). This is the position in England, while on the continent of Europe the patient, as a rule, is kept on her back. In the writer's opinion the left-side position offers great advantages over the dorsal. The genitals are more accessible and can be made visible while all the rest of the body is covered, whereby the patient is protected against taking cold. Her pudicity is consulted by the mere fact that she does not see the accoucheur, and, as it were, hides herself. This position renders it possible to perform certain small operations, such as episiotomy and the application of serrefines, without frightening the patient, which in her excited condition is often worse than the pain incident to the manipulations themselves. The voluntary and involuntary use of the abdominal pressure is more limited; and, most of all, the left-side decubitus is useful because the fundus sinks down on the couch, so that gravitation works in a direction almost opposite to that given the fœtus by the uterine contractions. In this way the perineum has not to carry the weight of the baby in addition to the pressure exercised on it by the uterine and abdominal contractions. Finally, this position facilitates other measures taken for the protection of the perineum.

---

[1] Garrigues, The Best Posture in the Different Stages of Labor, Trans. Amer. Gynæcol. Soc., 1891, vol. xvi. p. 188.

FIG. 223.



Patient in left-side position.

Support of the Perineum. Repression of the Head.—As a chief cause of laceration of the perineum is a too rapid distention of the vulvar orifice, the writer prevents the head from emerging too suddenly by making moderate counter-pressure on the head during labor-pains with the flat hand, especially the soft muscular cushion formed by the ball of the thumb. To do it with the tips of the fingers cannot be recommended, as on account of their smaller dimensions and greater hardness there might be some danger of wounding the head, especially on fontanelles and sutures.

If the head does not recede of itself after the contraction has ceased, it is pushed back into the canal, so that some of the force of the following contraction is spent in advancing it over the same area, and the vulvar opening is not exposed to continuous pressure. On the other hand, when the head really passes the rima, it may be helped out by pressure in the direction of the symphysis pubis, rolling the face over the perineum and utilizing all available room at the pubic arch. Since the head is slippery, all the manipulations of it are much facilitated by covering it with a cloth wrung out of alcohol or bichloride of mercury solution, whereas lysol is too oily for that purpose.

Enucleation of the Head.—Another good way of protecting the perineum is to press the head out during an interval between labor-pains by pressure with one or two fingers from the rectum. In so doing the accoucheur should, of course, avoid injuring the eyes of the fœtus; but the rectovaginal wall is so thin that everything is felt very plainly. Another factor to be borne in mind is not to use so much force as to cause tears in the region of the maternal clitoris, which may give rise to dangerous hemorrhage.

The administration of *chloroform* is also a great protection for the perineum.

The Shoulders.—So far we have considered only the dangers accruing to the perineum from the passage of the head; but it is threatened as much, or even more, by that of the shoulders. Examining during the interval which generally follows the expulsion of the head, the writer has often convinced himself that the skin between the posterior commissure and the anus was intact, and still found a considerable laceration of this part after the birth of the child. As with a normal child there is no longer any difficulty in delivery when once the shoulders have passed, we must attribute the accident to the passage of these parts of the fetal body. This is also easily understood when we think of their different conformation. In consequence of its circular circumference, its tapering top, and its alternate progression and retrocession, the head will in most cases open the vulvar ring gradually and distend it uniformly. The combined chest and shoulders, on the contrary, measure much more from side to side than in the anteroposterior direction. The shoulders contain hard, bony portions embedded in soft surroundings, they form an abrupt projection from the comparatively thin neck, and are commonly expelled all at once by a single labor-pain. All these circumstances render them more dangerous than the head, and they have only the one advantage of coming after the genital canal has been dilated by the latter. We must, therefore, not think we are done with the protection of the perineum because the head has been safely delivered. Sometimes help may be afforded by pushing back the posterior shoulder a little, and thereby facilitating the descent of the anterior. Or the anterior shoulder may be helped down by hooking the index-finger into the axilla and pulling the shoulder under the pubic arch. When first the anterior shoulder has passed, it should be pressed well forward, so that no room be lost. If exceptionally there is a tendency of the posterior shoulder to pass first, this movement may be favored by inserting the index-finger in the corresponding axilla and pulling it forward.

The writer does not approve of applying direct pressure to the perineum, which, instead of being protected thereby, is endangered still more by being compressed between the hard head of the fœtus and the bones in the hand of the accoucheur.[1]

Compression of the Uterus.—If the contractions of the uterus are normal, no pressure should be exercised on it, as this would overstimulate the organ, and might lead to later exhaustion or cause injury to the genital canal, especially the vaginal entrance and perineum. Compression after delivery is, on the contrary, very useful, and will presently be considered. Moderate pressure on the fundus uteri is also allowable if the contractions of the uterus and abdominal muscles are defective.

The head must under no circumstances be pulled on in the attempt to help out the shoulders. All that may safely be done is to hold it between the flat hands and press it a little upward or downward. As a rule, I do not touch it after once it is outside of the genital canal.

Liberation of the Umbilical Cord.—At this stage the accoucheur should ascertain whether the cord is wound around the neck, and, if so, whether one of the ends yields on moderate traction. As soon as the loop becomes large enough he should pull it over the head of the fœtus, but, if he meets with too much resistance, he should tie the cord with two ligatures an inch apart and cut it with blunt-pointed scissors.

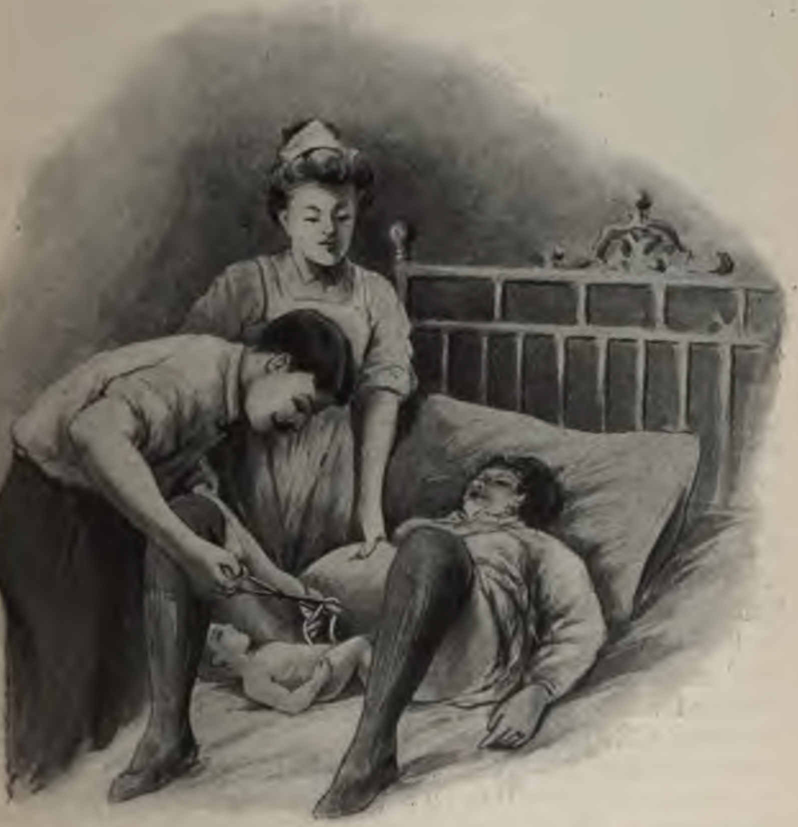
When the shoulders are born, there is no more resistance; but, since according to law the child is not born and has no right as such until its *whole* body is outside of the mother, I am in the habit of pulling it out.

Next the mother should be turned on her back, as the dorsal decubitus is much better than the left-side position during the third stage of labor. She lies with bent knees, and the child is placed transversely in front of her genitals. The accoucheur needing both his hands, the nurse should take hold of the uterus, with four fingers behind and the thumb in front (Fig. 224), and compress it firmly.

---

[1] The writer has entered more in detail into the question of "The Obstetric Treatment of the Perineum" in an article published in the American Journal of Obstetrics, vol. xiii., No. 11, April, 1880.

FIG. 224.



Child placed transversely in front of mother's genitals, nurse compressing the uterus, doctor cutting the cord.

Tying and Cutting the Cord.—The accoucheur should now take the umbilical cord gently between his thumb and index-finger, and when pulsation stops he should tie the cord and divide it with scissors. The cutting is done in the way which is most convenient for the doctor and safest for the baby by holding the cord between the thumb and the ring-finger in front and between the index and the middle finger behind, and cutting between the fingers. For the ligation of the cord I prefer the thickest ball cotton, taken double, which is soft, strong, and sufficiently wide. Two ligatures are used. I tie the two ends of each together, and make the double thread about twelve inches long. Before placing it around the cord, the accoucheur should satisfy himself that the abdomen is closed and that no part of the intestine lies in the cord. After having found everything normal, he places his first ligature around the cord about three-quarters of an inch from the skin. This ligature should be well tightened, especially if the cord is "fat," since its *rôle* is to close the three vessels of the umbilical cord. I take only half a hitch on one side, bring the ligature around on the other side, take another half hitch, tighten again, and then tie the ends in a double bow. The second ligature is placed around the cord an inch nearer to the mother, and simply tied in a knot, and then the cord is cut midway between the two ligatures (Fig. 224).

A few words will explain why these little things are done in this way and not otherwise. By waiting till pulsation stops in the cord we allow a certain amount of blood, which otherwise would remain in the placenta and to which the child has a natural right, to be propelled into its body.

By making the stump of the cord short we avoid an undesirable leverage, a dried-up stump three finger-breadths long being pulled hither and thither by the bandage and perhaps broken off prematurely. We also obtain the advantage of having less decaying material in connection with the child.

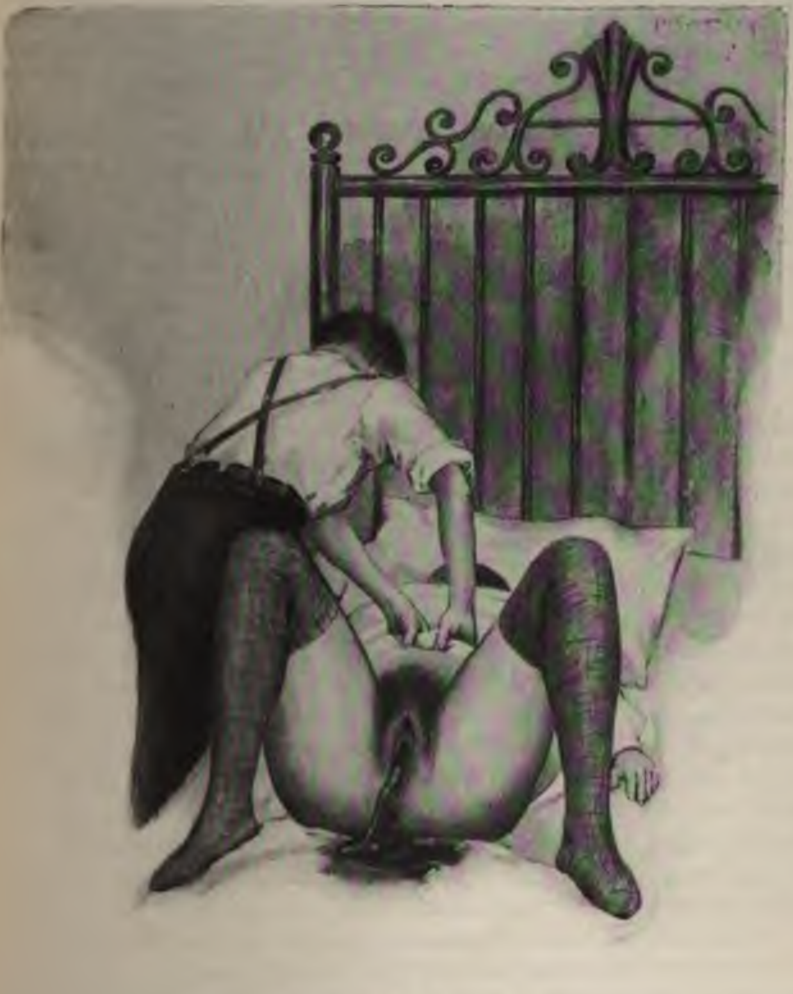
We put on the first ligature with great care and tie it in a bow so that, if on later inspection it proves not to be tight enough, but to allow some oozing of blood, we may easily tighten it. The second ligature serves only to arrest bleeding from the placenta, which will be thrown off in a few minutes. It is chiefly put on for cleanliness' sake, so as not to have the placental blood soil the bed; but a second reason for using it is that there may be a second child connected with the same placenta, which might bleed to death from loss of blood.

If the cord is very thick, it is well to press some of the gelatin of Wharton in the direction of the mother before tying the cord.

When the cord has been tied, the child is wrapped up in a warm piece of flannel, and outside of that a shawl, quilt, or blanket. The whole child should be covered, inclusive of the head, just leaving a little opening to give access to air. New-born children do not need much air, but they are very sensitive to cold. Having placed the child in a safe place at the lower end of the bed, the accoucheur returns to the mother. He now relieves the nurse in compressing the uterus.

Expression of the Placenta (Fig. 225).—If the uterus is not well contracted, he should move the abdominal wall over the fundus from side to side and grasp the uterus tightly. If all is normal, he just holds the uterus in the hollow of his hand. When he feels a new strong contraction come on,—a so-called *after-pain*,—he should place his eight fingers behind the uterus and the two thumbs in front, and during the pain squeeze the uterus like a lemon. When the pain ceases, he stops squeezing and again holds the uterus with the left hand, waiting quietly for the next pain to come on, when he repeats the squeezing with both hands. At the third or fourth pain the placenta rolls out into the bed, retained only by the inverted membranes.

FIG. 225.



Expression of the placenta.

This is essentially the method invented by Credé, of Leipsic.

Still there are some differences. Credé seized the uterus with only one hand and pushed it in the direction of the hollow of the sacrum, wherefore the adversaries of his method say that he did not loosen the placenta, but pressed it down to the vaginal entrance and out through the rima pudendi, using the empty uterus, which is hardened by massage, to press with. In my opinion this is a mistake. At least I know for sure that by my modification of the method I squeeze the placenta out of the womb, and it is likely that, by increasing the contractile power of the musculature of the uterus, I aid it in throwing off the placenta. The pressure against the sacrum appears to me unnatural and apt to do harm by loosening the connection between the uterus and the pelvis, whereas the squeezing imitates and sustains nature. I differ from Credé also in regard to the time when the placenta is expressed. According to him, the sooner it is done the better, and he gave four and a half minutes as the average time for the expression. In my experience so early an expulsion leads to retention of membranes and to hemorrhage. In the way I use the method it takes from fifteen to twenty minutes.[1]

When the placenta rolls into the bed, part of the inverted membranes accompanies it. The portion thus extruded should be seized with both hands, while the compression of the now empty uterus is again left to the nurse, and the placenta is turned slowly round so as to form a kind of rope of the membranes. In so doing the accoucheur should bear in mind that the thin, elastic membranes cannot be thrown off like the thick, blood-filled placenta. They still adhere to the lower part of the inside of the uterus. If the rope is twisted too fast, the membranes will be torn off, which may give rise to severe hemorrhage and necessitate the introduction of the hand into the uterine cavity in order to remove the retained portion. The placenta should, therefore, be rotated very deliberately, and the rope should not be seized between the thumb and the index-finger, as then we might exercise undue force, but only between the index and the middle finger, alternately placing one hand behind the other, until the last end of the ovum is slowly pulled out (Fig. 226). The placenta and membranes together are called the *after-birth*, or *secundines.*

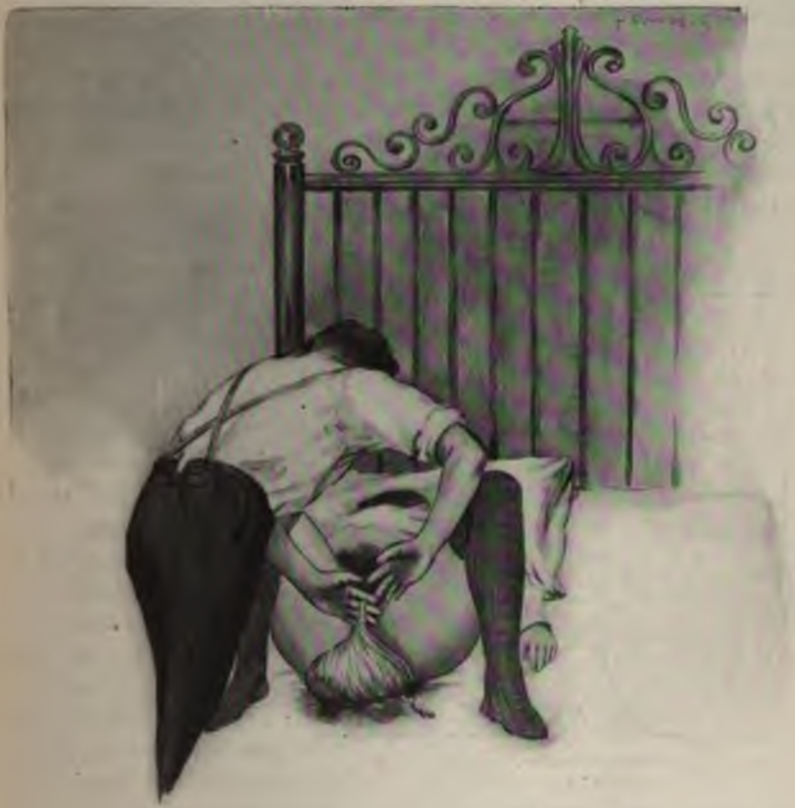
When the after-birth has been removed, the doctor should carefully inspect it and satisfy himself that nothing has been left behind. Then it is temporarily deposited in a clean chamber-pot, and later buried or burnt in the range, but not cast into a water-closet, the pipes of which it would block up.

---

[1] Some details about the three different methods of removing the after-birth—by pulling on the cord, by compressing the uterus, and by leaving the whole third stage to nature—are found in my paper on "Removal of the After-birth," Amer. Jour. Obst., vol. xvii., No. 5, 1884.

Next the perineum should be examined, and if it is torn it should be stitched. Then the patient should be cleaned, and as this is an important part of the whole act, during which the patient might be infected, it is much better that the accoucheur should attend to it himself than leave the performance of this duty to the nurse; but while the doctor does the cleaning, the nurse should continue to hold the uterus moderately compressed with one hand. I usually tear off three pieces of unbleached muslin, and wash all soiled parts of the skin with lysol water and wipe them dry with clean towels. The interior of the genitals should not be touched, but the mons Veneris and the outside of the labia should be washed with absorbent cotton

FIG. 226.

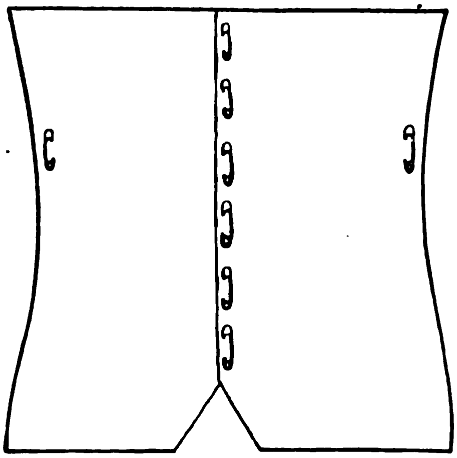


Extraction of the membranes.

dipped in lysol water. If the pubic hairs are matted together with blood-clots, it is better to cut off some of them.

Abdominal Binder.—When the woman has been washed and wiped dry, certain bandages should be applied. The writer improvises these himself at the time they are to be put on. First comes the binder, a piece of unbleached muslin long enough to go once around the abdomen and overlap a little, and wide enough to extend from the trochanters to the ensiform process. The unbleached muslin ordered being a yard wide, I double it lengthwise, put the fold downward, and tear off the superfluous tissue at the upper end. This binder is drawn tightly together in front of the lower part of the abdomen, leaving the ends free. Next I go upward, always tightening the binder and inserting large safety-pins perpendicularly, so as to place them at right angles to the direction in which the bandage would open. When the waist is reached, a fold is taken in on each side and fastened with a pin, and finally one or two more are placed in the median line. A good nurse can pin such a binder very accurately, folding in the free end of the binder and using a large number of bank-pins, which she places transversely at short intervals from one another. Such an arrangement looks very pretty, but for practical purposes half a dozen large safety-pins placed lengthwise suffice. We return now to the lower ends and fold the free flaps in so as to have a Λ-shaped opening in front of the pubes (Fig. 227).

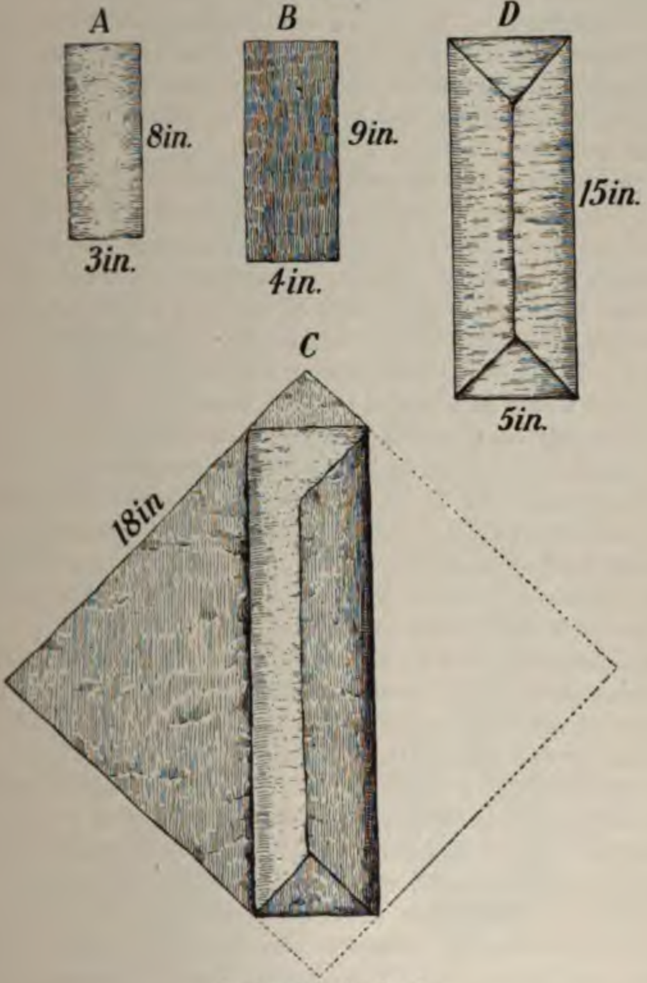
Fig. 227.



Abdominal binder.

Garrigues's Occlusion-Dressing.—Next we apply a pad to the perineum (Fig. 228, *A*). This consists of four parts,—an absorbent inner portion, a water-proof middle layer, a third layer to give bulk, and an outer layer to keep all in place. Innermost there is an oblong made either of absorbent lint eight inches long and three inches wide, four layers thick, or a pad of absorbent cotton formed so as to have similar proportions, which correspond to the distance between the genitofemoral furrows and the length of the perineum. The lint or cotton is wrung out of lysol water. Outside of this absorbent material comes a piece of gutta-percha tissue (Fig. 228, *B*), an inch wider and longer than the former. It is washed in lysol water and bent forward against the inside of the thighs. Outside of this is placed a piece of muslin, half a yard square and folded like a cravat (Fig. 228, *C*) so as to be five inches wide. Inside lies some cotton, and the ends are folded in so as to make the oblong about fifteen inches long (Fig. 228, *D*). This is pinned to the binder with four small safety-pins in front, placed transversely and occluding the Λ-shaped opening left, and two similar pins behind (Fig. 229).

Fig. 228.



Garrigues's perineal pad.

It will be seen that the binder forms a necessary support for my perineal pad; but independently of that I am decidedly in favor of its use, as it steadies the uterus and compresses the abdominal wall, whereby involution is furthered, and the unsightly prominence of the abdomen so often observed in women who have not been properly nursed in childbed is avoided.

Some think every kind of perineal dressing is superfluous, others just put a loose napkin in between the thighs; but my pad has at least the advantage of protecting the genitals against contact with unclean objects; it makes the patient feel comfortable; and it is very popular with the laity because it is supposed to protect the parts against cold, this bugbear suspected by the public to be responsible for almost any disease.

The principles of this treatment may be followed even when strict economy is imperative. Then common cotton batting may be substituted for the more expensive absorbent cotton in the outer part of the dressing, where it only serves to make bulk, or even, though less well, in the inner, antiseptic, part of the pad. Gutta-percha tissue may be replaced by the much cheaper oiled muslin, or even left out altogether. Instead of lysol one may use carbolic acid. In this way the expenses would be reduced to eight cents for a bundle of cotton batting, thirty-six cents for six yards of unbleached muslin, ten cents for two dozen safety-pins, and forty cents for eight ounces of carbolic acid,—ninety-four cents in all. Women who cannot afford that small expense had better be delivered in some charitable institution, or the doctor may omit all dressings and bring with him some bichloride of mercury tablets or carbolic acid for disinfection of his own hands. If the forceps is used, it should be boiled.

Preliminary Douche.—In former writings I have recommended to give a disinfectant vaginal douche before delivery. In this respect I have changed my views and practice, but there is much to be said on both sides, for and against the preliminary douche. Those who are opposed to it say that it has been proved that there are no pathogenic bacteria in the normal vaginal secretion of pregnant women, that it even has the power of killing microbes experimentally brought in, that it is a useful lubricant, and that the danger of carrying infecting germs into the vagina with fingers and syringes is greater than the advantage to be derived from the germicidal properties of the fluid injected; and, finally, that if there be microbes in the vagina they will not be removed by administering a douche.

To this may be answered, that the vaginal secretion frequently has lost its normal alkalinity and thereby its germicidal power. Furthermore, pathogenic microbes may be brought in through coition or other contact immediately before labor. The writer recently saw a case in which the husband, a laboring man, when his wife complained of pain, satisfied himself by vaginal examination every morning

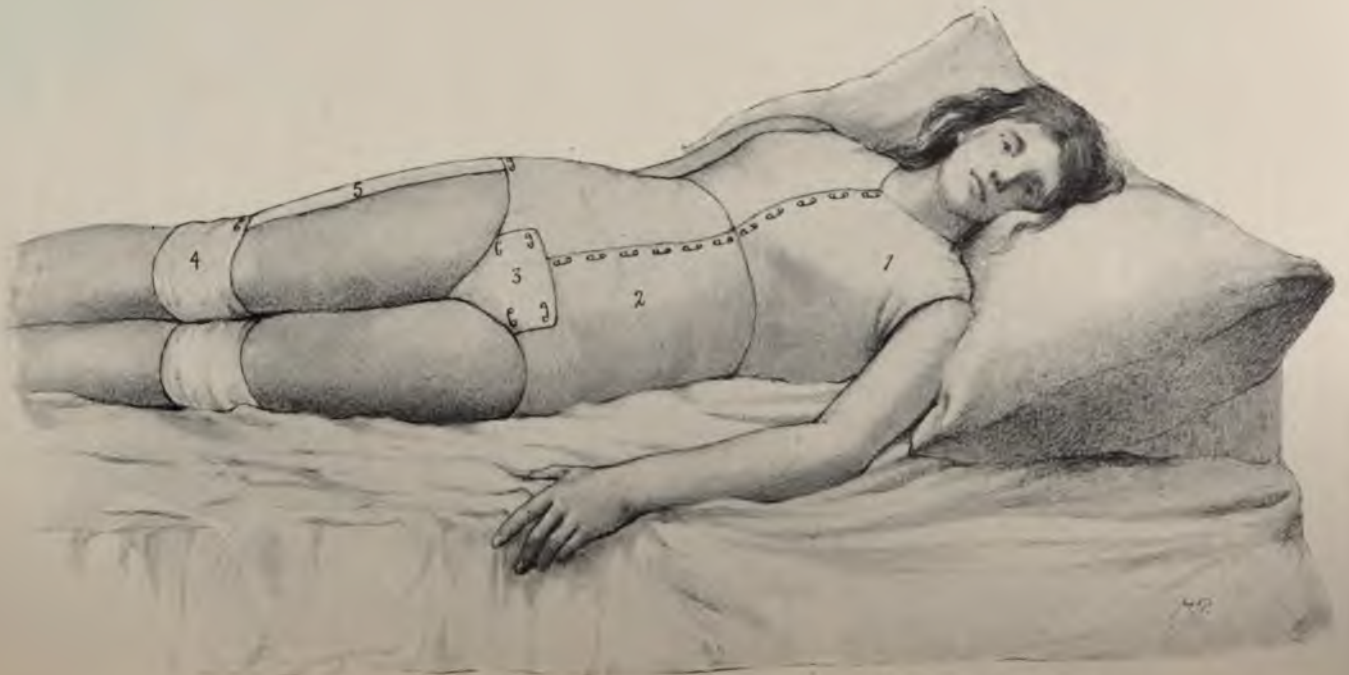


FIG. 229.—Patient with all bandages. 1, waist; 2, binder; 3, occlusion dressing; 4, knee bandage; 5, suspender.

before going to work that the os had not begun to dilate! The normal glairy fluid which lubricates the parturient canal is poured out in abundant quantity, even if a vaginal douche has been given at the beginning of labor. If the douche cannot remove all the microbes found in the vagina, it may at least reduce their number sufficiently to enable nature to master those left. But since there is a real danger of infection being carried by fingers and instruments, and since there is abundant evidence that the best results may be obtained without using any prophylactic douche, it is better under ordinary circumstances to omit it. If, however, the vaginal discharge is neutral or acid, and especially if it is purulent, a douche of two quarts or more of a one per cent. solution of lysol or carbolic acid should be given before making the vaginal examination.

The distrust of the efficiency of the douche has led some to recommend instead rubbing or scrubbing of the vagina as in preparing it for a gynæcological operation, but, since this cannot be done without removing the epithelium in places, such a procedure is likely to do much more harm than it can possibly do good, and ought, therefore, to be deprecated.

Catheterization.—It is of great importance to keep the bladder empty or only slightly filled during labor and delivery. Braune's plate, Tab. C (Fig. 205, p. 169), has taught us that during labor the whole bladder is pulled up above the symphysis and becomes stripped of its peritoneal covering. The smaller its surface, the easier this will be done. Before the use of the obstetric forceps had become so common as in our time, vesicovaginal fistulæ, involving a large portion of the base of the bladder, were by no means rare, and they were due to compression of the organ between the head and the symphysis. The viscus being drawn up, the urethra becomes much lengthened and is often compressed, so that the patient cannot urinate. It then becomes necessary for the accoucheur to draw the urine, and, as the urethra is so long, the common female catheter will often be found too short. If a soft-rubber catheter can be passed, it is safest of all on account of its flexibility. If it cannot, a male metal catheter should take its place. By having it of flexible metal, we obtain the great advantage that we may change the curvature to fit each case. In order to pass one, it may, however, become necessary to lift the presenting head from the vagina. Whatever catheter is used should be disinfected by boiling a few minutes in a solution of soda (an even tablespoonful to a quart of water).

Anæsthesia.—Every woman ought to know the name of Sir James Y. Simpson, who in 1847 introduced the use of chloroform in normal childbirth. He met with great opposition when he first advocated this novelty. The medical profession thought it dangerous, and the orthodox clergy found it sacrilegious; but science prevailed, and found a mighty ally in no less a person than Her Majesty Queen Victoria, who adopted the new method in her next confinement. So august an example could not fail to find numerous imitators, and soon the custom spread from Great Britain over the whole civilized world. Occasionally I meet with a person who is afraid of the anæsthetic and prefers to suffer; but I have never seen a woman in labor who after having smelled chloroform once and experienced its wonderful effect would do without it. Some women give birth to their children with so little pain that they do not need any anæsthetic, and they are rewarded for their fortitude by a shorter duration of labor and greater safety in regard to hemorrhage. Even if given intelligently, chloroform prolongs the interval between uterine contractions and—I do not think we can deny it—predisposes to post-partum hemorrhage. If used too early and in too large a quantity, it becomes dangerous. The writer's practice is to defer its use as long as possible, for when once we begin we must give it every time pain returns, unless there arises a positive counterindication to its administration. I give it always when the head appears at the rima pudendi, but if the woman suffers much I give it earlier in the second stage, never in the first.

In obstetric cases chloroform should be given in an entirely different way from that used in operations. Some nervous and pusillanimous women think the doctor can anæsthetize them when they feel the first pain, and keep them unconscious till the child is born. This would be exceedingly dangerous for mother and child, and ought, therefore, not to be thought of. The way to give chloroform is at the beginning of a contraction to pour eight or ten drops on an Esmarch mask (Fig. 221) and apply it over the patient's nose and mouth. As soon as the pain ceases it should be removed. It is only during the few minutes while the head passes the rima pudendi, and when the pain is greatest, that the patient is kept anæsthetized to the surgical degree and uninterruptedly. As soon as the head is born no more chloroform should be given.

In private practice hardly any other anæsthetic than chloroform is used. For protracted obstetric operations, such as Cæsarean section or symphyseotomy, the writer prefers ether, as in all other operations, on account of its greater safety.

Medullary Cocainization.—After the German surgeon August Bier had published[1] his discovery that anæsthesia may be produced in the lower half of the body of man without causing unconsciousness, by injecting cocaine into the spinal canal, this method was for some time used rather extensively in gynæcological and obstetrical operations and even in normal labor cases. In this country it found an enthusiastic spokesman in Dr. S. Marx.[1]

---

[1] Bier, Zeitschrift für Chirurgie, April, 1899.

The patient is placed in a sitting posture on a table and made to bend forward until the lumbar region forms a convex curvature. If she cannot sit up, she may lie on the left or right side with arched back. The field of operation is disinfected as well as the operator's hands. A sterilized needle, ten centimetres (four inches) long, is pushed in between the fourth and fifth lumbar vertebræ. The operator places his left thumb on the spinous process of the fifth lumbar vertebra and pushes the needle in immediately above and just outside of the nail, in a direction going straight forward. He should push it rapidly through the skin, but thereafter proceed slowly. If it strikes a bone, the direction must be altered a little. The needle must enter the subarachnoid space, when the cerebrospinal fluid will flow out drop by drop. This is the only criterion that the needle is in the right place, and has also the advantage of forcing the air out of the hollow needle. In order to avoid a possible breaking of the point of the needle, the bevelled part of it is made very short. To the needle is screwed a common hypodermic syringe containing a sterile, freshly prepared two per cent. solution of hydrochlorate of cocaine. Since cocaine is decomposed by heat, the salt should be dissolved in sterile water and only boiled for one minute. Of this solution from ten to fifteen minims are injected, containing from one-fifth to one-fourth grain of the salt. Fully a minute should be devoted to the injection, and the syringe should not be removed from the needle for at least two minutes after injecting.

Occasionally there is a preliminary hyperæsthesia, but this is transient, and in from two to fifteen minutes anæsthesia is generally complete. If at the end of half an hour the desired result is not obtained, or if after complete anæsthesia the sensation of pain returns, the injection may be repeated. In this way three-fourths of a grain has been injected within an hour. The anæsthesia extends always from the umbilicus downward to the tips of the toes, and sometimes up to the neck or even the vertex. It lasts from thirty minutes to several hours. The immediate result and the sequels are not pleasant. Complaints of burning pains in legs and feet are common. Frequently there are nausea, vomiting, severe headache, profuse perspiration, and chilly sensations. The pulse-rate increases and the temperature may rise to 103° F. In some cases rigidity of the muscles of the back followed the injection and lasted for a week. Alarming respiratory failure, staggering gait, tingling and numbness, great spinal pain on the day following the operation, and vertigo have also been observed; likewise a case of cyanosis, pulselessness, and loss of consciousness.

---

[1] Marx, Medical News, August 25, 1900; Medical Record, October 6, 1900.

In some cases no anæsthesia has been obtained or it has been more or less imperfect. A disagreeable feature is the tendency to involuntary defecation and urination sometimes observed. In several cases the medullary cocainization has resulted in death.

In multiparæ the injection should be made when the os is three-fourths dilated, in primiparæ when it is fully dilated. By repetition of the injection during eight hours patients have been carried practically without pain through their labor. Explorations, versions, extractions, and placental removals were readily done, not with quite as great ease as under chloroform, but with greater facility than in a non-anæsthetized woman.

In order to avoid some of the unpleasant or dangerous effects, especially vomiting, headache, and heart-failure, it has been recommended to give twenty grains of bromide of potassium a couple of hours before and one-tenth of a grain of strychnine hypodermically immediately before making the intraspinal injection.

The author has not used medullary cocainization, and does not intend to do so. In his opinion this new method of inducing analgesia has a very limited field in general surgery,—namely, in patients in whom on account of combined heart and kidney disease both chloroform and ether seem undesirable. Even those who are in favor of the method do not recommend it for laparotomy. It does not give the needed laxity of the abdominal wall, and the peritoneum has proved sensitive when there was complete anæsthesia of the lower extremities.

In obstetrics I do not think there is any call for this innovation. Cocaine is at best a treacherous drug. The individual susceptibility to it varies enormously, and the effect is also different in different parts of the body. The nearer to the brain the application is made the greater is the danger; and if in this case the puncture is made far away from the encephalon, on the other hand the injected fluid mixes with the cerebrospinal fluid, which directly bathes the whole central nervous system. It is impossible to know exactly where the end of the needle is, and we may therefore unawares inject the fluid either into a nerve of the cauda equina or into one of the large veins that surround the spinal marrow. Whether the injury to a nerve would have any bad effect is not known, but the injection into a vein is not unlikely to be dangerous, and may account for some of the numerous undesirable threatening or fatal effects observed in some cases.

While the drug itself and the place of its application are a source of danger, there is also considerable danger of sepsis. Do what we like, the skin cannot be disinfected. In the deeper parts of the cutaneous glands the microbes find a lurking-place from which no amount of disinfectants applied to the epidermis can dislodge them. In passing through the skin the needle may therefore carry them into the spinal canal, where they still more escape our vigilance and may begin their deleterious work. I am fully aware that this would also apply to hypodermic injections, of which hundreds are given without causing inflammation. But occasionally we see even such an injection followed by the formation of an abscess, and if carried right into the cerebrospinal fluid or into the lumen of a spinal vein, the effect would probably be much more serious. The danger of sepsis is therefore immanent in this method.

Even if the patient comes safely through the operation, certain most important after-effects, such as vomiting, severe headache, etc., await her in nearly all cases. The puncture itself made with a needle that must have solidity enough not to break, especially a repeated puncture, must cause an amount of pain which cannot be disregarded any more than the patient's fear of what she is going to suffer in her perfectly conscious condition.

Looked at from the special stand-point of the obstetrician, the method seems to have serious drawbacks. All sensation of pain being absent, the distention of the perineum cannot call into operation the normal reflex contraction of the abdominal muscles, as a result of which the second stage of labor is unduly prolonged or tempts the accoucheur to abbreviate it by operative interference. Thus, in a report of twenty-two cases of normal labor treated with medullary cocainization, I find that delivery was accomplished seven times by forceps and three times by manual extraction or version. If it is necessary to deliver artificially in nearly half the whole number of cases, that alone would be enough to condemn the procedure.

Finally, it seems to me utterly superfluous and uncalled for to subject the parturient woman to the multifarious discomforts and great dangers of medullary cocainization when in chloroform we have an absolutely ideal anæsthetic for the alleviation or abolition of the throes of labor. Whatever may be thought of the safety or danger of the use of this drug in surgical operations, in labor cases there has never, to the writer's knowledge, been reported a case of death attributable to its administration. The reason of this wonderful immunity is probably to be found in the condition of the heart, which by the exertions incident to labor is strengthened to its utmost vigor. The accoucheur can vary the amount given and the intervals between the applications of the mask to a nicety, and at any moment discontinue the anæsthetic. He can allow so much pain to be felt as he thinks necessary to call into action reflex contractions and to avoid post-partum hemorrhage. He can, so to say, merely take off the edge of the pain, or he can produce so deep an anæsthesia that the greatest operations may be performed without the knowledge of the patient. There are no unpleasant sensations whatsoever connected with the use of chloroform either during or after its administration. It affords simply unspeakable relief to the poor sufferer. If used in normal labor it is not even followed by vomiting or nausea, as is sometimes the case after operations. The moment the child is born, the mother is as free from pain and discomfort as when no anæsthetic has been given.

Hypnotism.—Hypnotists claim that, at least in some women, they can produce such a deep sleep that the patient is not awakened by the pains of labor, and that after awakening she has no recollection whatever of what has taken place. I was once invited by a very skilful and experienced hypnotist to witness the effect of hypnotism in a confinement case. On other occasions I had seen this man produce all sorts of hallucinations, take away pain, and even make the pulse beat simultaneously with different frequency at the two wrists of the same person, and in this case the patient was quite accustomed to being anæsthetized. It was her sixth confinement, and the child was small, weighing between five and six pounds. But in spite of all these favorable circumstances, the exhibition was almost a complete failure. The patient complained of headache. The doctor stroked her head, and it passed off immediately. But labor-pains made her groan and contract her face just as much as any other woman, and on being questioned she said she had bad pain. When the head began to distend the vulva and when it passed, she cried out wildly and declared she had never suffered so much. Of course, it is far from me, on account of this single case, to reject what has been stated by several hypnotists here and in Europe; but if we take into consideration that only few physicians can produce the hypnotic condition in the patient, that, as a rule, the hypnotist has gradually in repeated sittings to gain power over the patient, and that many think that hypnotism weakens the nervous system, it is not likely that suggestion will replace chloroform to any extent.

CHAPTER VIII.

CARE OF THE NEW-BORN CHILD.

WHEN the accoucheur is through with the mother, he should return to the child, which had been temporarily placed, properly wrapped up, at the foot of the bed or in some other safe and suitable place. He should inspect the navel-cord and satisfy himself that there is no bleeding. If there is, he reopens the ligature and tightens it.

Next, the eyes should receive attention. In lying-in hospitals they should be washed outside with a saturated solution of boric acid, and, spreading the lids open between the left thumb and index-finger, one drop of a two per cent. solution of nitrate of silver should be allowed to fall on the centre of the cornea from a dropper, or preferably from a solid glass rod, since the latter holds only one drop, while by a careless use of the dropper sometimes several drops have been squirted into the eye. This method was invented by Professor Carl F. S. Credé, of Leipsic, and shortly after, on the 14th of October, 1882, introduced by the author in America.[1]

The object of this treatment, which may seem unnecessarily harsh, is to preserve the infant from acquiring ophthalmia neonatorum by infection during its passage through the parturient canal of a woman suffering from gonorrhœa. Before the preventive treatment was generally adopted, this purulent ophthalmia was a very common disease of the eyes of new-born children in lying-in hospitals, and, according to large statistics, from one-third to two-thirds of those affected with blindness lost their sight from this cause. When once the disease is developed, such care is needed to prevent it from ending in blindness that at least two nurses are required to carry out the necessary treatment, consisting in frequent irrigation of the eyes with saturated solution of boric acid and still more frequent applications of ice compresses to the lids. If now we take into consideration how often the gonococcus is found in the vaginal secretions of the women delivered in lying-in hospitals, and that the instillation of silver nitrate is an almost infallible preventive and, as a rule, is quite safe, there cannot be any doubt about the wisdom of using this prophylaxis as routine treatment in such institutions. In most cases there is no reaction whatsoever. In some I observed a slight serous discharge from the conjunctiva, which disappeared in a few days without any treatment. I do not use this method in private practice except when I know that the mother or the father of the child recently has had a gonorrhœa, or in cases in which the mother during pregnancy has been suffering from a purulent discharge from the vagina. If I use this preventive, I do it without calling any attention to it, or even without the knowledge of the parents. Under such circumstances the danger of the child falling a victim to purulent ophthalmia is so great that remote possibilities of trouble arising from the instillation ought not to carry weight.

Of late protargol in a 10 per cent. solution has been substituted for the nitrate of silver. It is said to be as effective and much less irritating. Under ordinary circumstances I take it to be sufficient to wash the eyes of the child with plain cold water or saturated solution of boric acid and a fine pledget, be it sterilized gauze or absorbent cotton, or a piece of a fine pocket handkerchief.

---

[1] Henry J. Garrigues, Prevention of Ophthalmia Neonatorum, Amer. Jour. Med. Sci., October, 1884.

When the eyes and the mouth have been cleaned, but not before, the baby should have its bath. Officious by-standers are very apt to offer their services in washing it immediately after its birth, and even to complain that it is being neglected. This is without foundation. The child does not suffer in any way when it is properly wrapped up and safely deposited, whereas, the third period of labor being by far the most dangerous for the mother, full attention should be concentrated upon her, and the child should wait till everything has been done for the mother.

Whenever possible, the child should be bathed in a baby washtub. Small children hate as much to be washed as they delight in moving their little limbs without restraint in the lukewarm water of the bath. As a rule, the accoucheur leaves the cleaning of the child to the nurse, but he should certainly in the beginning of his career practise this part of the duties of the lying-in room himself, and be perfectly familiar with all its details, if for no other reason, in order to be able to give intelligent instructions and supervise the work of the nurse. The water should be slightly below the temperature of the blood,—about 98° F. If no thermometer is available, the nurse may use her elbow—not her hand, which is more accustomed to high temperature—for testing that of the water. White Castile soap should be used, as it contains neither coloring matter nor perfumes nor acrid substances; but soap does not easily remove the vernix caseosa. In places where much of this substance has accumulated, especially the armpits and the groins, the child should first be anointed with sweet oil. In washing the head, care should be taken that the soap does not trickle down into the eyes. The child should all the time be sustained by placing the left hand under the back of the head, so as to hold the face above the surface of the water. When the child is clean, it is lifted out of the bath and dried with a warm, soft towel or cotton cloth, and dressed.

In private practice all I personally do for the navel-cord after having tied it is to put a piece of absorbent cotton over it, which comes off in the next bath, and I have never had a case of inflammation arising from the navel; but since in cutting the cord we leave a wound, and since, as we shall see later, this is a chief source of disease in the new-born child, it is rational to dress it antiseptically. In so doing we should avoid fatty substances, and use only dry powders which contribute to the mummification of the stump; for instance, one part of salicylic acid mixed with five parts of starch, or equal parts of subnitrate of bismuth, tannin, and lycopodium, or pure boric acid.

Some have of late closed the wound in the cord with a running catgut suture, uniting the edges of the amniotic sheath. The cotton is kept in place by surrounding the middle of the abdomen of the child with a piece of flannel two feet long and about six inches wide. It goes once and a half times round the body, and is fastened in front with safety-pins. Next, a little woollen undervest is slipped over the chest and abdomen and upper part of the arms. Then the buttocks and groins are covered with a diaper,—that is, a square piece of muslin or linen folded so as to form a triangle, the base of which lies on the child's back, while the three ends come together in front and are fastened with a safety-pin. Then a long flannel petticoat or a square piece of flannel going half a yard beyond the feet is fastened around the waist and folded up in front of the legs. The feet are covered with woollen socks. Outside of the flannel petticoat is put one of white cotton, and finally a white dress, when the baby is ready to be presented to its mother.

CHAPTER IX.

MIDWIVES.

In foreign countries and in all the States of the Union except Nebraska, a large number of confinements are in the hands of midwives. In the city of New York more than one-half of the parturient women are attended by this class of helpers. Most of them are Germans, Scandinavians, or Italians by birth, and are employed chiefly by their own countrywomen, the American and the Irish women being too intelligent and well informed to avail themselves of these ignorant and uncleanly beings. Originally any woman who had herself borne a child assisted her friends in their labors, but in the course of time special authorized guilds of midwives were formed who alone possessed the right to practise the art, and who called in a physician only when they found themselves incapable of completing a delivery. It was first in the beginning of the seventeenth century that in Paris doctors commenced to assume the direction of normal labor cases. In the year 1600 Charles Guillemeau and Honoré began to be in great request by most ladies of quality. In England physicians were not employed in normal labor cases before the end of the eighteenth century, and at first the so-called men-midwives met with great opposition. In Germany the old system obtained much longer and to a great extent still exists, but it has become quite usual for well-to-do women to employ physicians as accoucheurs instead of midwives. In Denmark also some years ago physicians began to attend normal labor cases. The reason of this gradual domination of the field of midwifery by physicians is that the superiority of the new system over the old at once becomes so manifest wherever it is tried that women conquer their natural aversion to the exposure of their persons to the sight and touch of the male practitioner of midwifery.

Compared with men, women have done very little for the advancement of the obstetric art. Of the hundreds of thousands of midwives who have plied their art only four have given expression to their experience in printed books, three in France and one in Germany. The oldest work of this kind is that of Louyse Bourgeois (1609), but that of Guillemeau bears the same date. Justine Siegemundin published her "Königliche und Churbrandenburgsche Wehemutter" in 1690. Mme. Boivin dedicated her work in 1811 to Mme. Lachapelle, whose pupil she styles herself. In 1821 the latter published the first volume of her treatise on "The Art of Accouchement," the last two volumes of which were edited by her nephew, Antoine Dugès, professor of obstetrics at Montpellier. Great as the experience and dexterity of these women may have been, the science and art of obstetrics is not a structure of their rearing, but of physicians from Hippocrates to the present time.

Obstetric work presents certain peculiarities which make it preeminently objectionable to tolerate its performance by half-taught or totally ignorant persons. Without a careful examination, of which even the best midwife, owing to her lack of scientific knowledge and training, is entirely incapable, it is in most cases impossible to foretell whether a labor case will take a normal course or present difficulties that can be met only by all the resources of the most advanced art, and, as an old French accoucheur said of labor, "If it is easy, it is nothing; but if it is difficult, it is the most difficult of all things." While in other branches of the healing art every case concerns the well-being or restoration to health of one human being, in obstetrics every case involves the fate of at least two individuals. Besides the specific services rendered by the obstetrician, at least three other specialties—internal medicine, surgery, and pædiatrics—are more or less constantly involved. In no other department does prevention of evil play a similar *rôle*. Very often the demand for immediate action is imperative, so that no time is left for examining books or consulting men of larger experience.

As we shall see further on, in no branch of the medical art has the inauguration of antiseptic measures wrought greater reduction in mortality. In an apparently simple case the greatest operations may become necessary, and the choice of methods and the results depend, first of all, on the aseptic condition of the genital tract. Unfortunately, many physicians are far from doing their duty in this respect; but most young men are now so well informed in regard to the advantages to be obtained by following the rules of antisepsis and asepsis in general surgery, in the surgical specialties, and even in internal medicine, that they are willing to take a reasonable amount of trouble in order to secure clean midwifery, whereas midwives do not understand the first principles of surgical cleanliness, and are as unwilling as they are incompetent to apply them.

They are also incapable of foreseeing complications, and by the time they realize that there is something wrong the evil may have become irremediable. Both mortality and morbidity are much greater in their practice than in that of physicians. The mortality in childbed in private practice in New York City is twice as large as that in the lying-in institutions. The pure, the healthy, the rich are apt to lose their lives by giving birth to a child in their luxurious homes, while the dissolute, those whose constitutions are undermined by disease, overwork, and care, those who are struggling with poverty for mere existence, are nearly sure of leaving the hospital in a better condition than they entered it.

The writer has in practice in a large dispensary which is used chiefly by foreigners, who almost exclusively employ midwives in their confinements, ample opportunity of seeing the bad effect of the poor assistance they receive in childbirth. A simple tear of the perineum, which the conscientious physician effectually repairs with a few stitches, is left to heal as best it can, and becomes the source of suffering and the cause of mechanical changes that later call for serious operations.

Children suffer under bad midwifery still more than their mothers. Not only is the mortality among them great, but that terrible scourge ophthalmia neonatorum, ending in life-long blindness, is much more common among the patients of midwives, who do not even surmise the importance of the case, and often recommend the use of imaginary remedies for what is supposed to be a mere cold, than among those of doctors, who have been taught the danger, and who either prevent the disease or cure it in its incipient stage, or turn the little patient over to the care of the ophthalmologist.

Even in European countries, where the pupil midwives are instructed in universities by the same professors who teach the students of medicine, where they have a course extending through years, and where they, after having entered on practice, are under strict government control,—even there constant complaints are being uttered in the medical press in regard to the inefficiency and shortcomings of midwives.

Midwives do harm not only through their lack of obstetric knowledge, their neglect of antiseptic precautions, and their tendency to conceal undesirable features, but most of them are the most inveterate quacks. First of all they treat disturbances occurring during the puerpery, later gynæcological diseases, then diseases of children, and finally they are consulted in regard to almost everything. They never acknowledge their ignorance, and are always ready to give advice. They administer potent drugs, such as ergot and opium. Their thinly veiled advertisements in the newspapers show them to be willing abortionists; and, since they have the right to give certificates of still-birth, who knows whether or not an infant's death is due to natural causes or to criminal manipulations?

Although an evil, midwives are, however, in most countries a necessity, in view of the fact that physicians would not find time to do the work needed; but this does not apply to America, where there is a superabundance of medical practitioners. According to the census of 1890,[1] the population of the United States on the first day of June of that year was 62,979,766, or, leaving out Alaska and the Indian Territory, 62,622,250. Of these 30,554,370 were females, but only 15,742,636 were in the childbearing age,—from fifteen to forty-nine years. At the same time there were 104,805 physicians and surgeons, which gives one physician for every one hundred and fifty women of a childbearing age. Now, we may, even by liberal calculation, estimate that on an average women in America give birth to only four children in all. Consequently the number of women in the childbearing age (thirty-five years) must be divided by about nine in order to find the average number of births *per annum*, which gives less than *seventeen confinements per year for each physician in the United States.*

In the State of New York the total population was 5,997,853, of which 3,020,960 were females. Taking the proportion for the United States, this leaves 1,155,190 women of childbearing age. Now, there were 11,139 physicians and surgeons, or one physician for every one hundred and thirty-nine women of childbearing age, or an average of a little more than *fifteen confinements per annum for each physician in the State of New York.*

In the city of New York, as it was before it was merged with the counties of Kings, Queens, and Richmond into Greater New York, the proportion between physicians and labor cases became still smaller. At the census of 1890 the total population of the city, corresponding to the boroughs of Manhattan and Bronx, was 1,515,301. Of these 767,722 were females, and by computation it is found that of these 395,556 were of a childbearing age. The number of male physicians was 3266; that of the female is not specified in the census, but the Medical Directory for 1897 shows that in that year there were 145, which gives a total of 3411 physicians and surgeons. Consequently there was one physician for every one hundred and eighteen women in the childbearing age, or an average of *thirteen confinements yearly for each physician practising in the city of New York.* Nobody will, therefore, deny that physicians can easily attend to all labor cases.

---

[1] At the time of going to press the published reports of the census of 1900 have not yet reached the subject of the business of the inhabitants.

Analogies cannot be drawn from European countries. New York has proportionately to the population nearly twice as many physicians as London, and the United States nearly three times as many as Great Britain. On the continent of Europe there are still fewer doctors, varying from one in two thousand to one in six thousand inhabitants.

Even those who object to male accoucheurs can to a great extent be conciliated, as nowhere is there such a number of female physicians. According to the above statistics, there were in 1890 in the United States 4557 and in the State of New York 693.

Another objection to the exclusive employment of physicians as accoucheurs has been raised on financial grounds; but with the large number of physicians who have plenty of spare time, their services can be obtained for the same price as those paid to a midwife. If the patient is too poor to pay even that modest sum, she can in the city of New York with the greatest facility obtain gratuitous help in her confinement, either in a hospital or in her own home, as she prefers. The explanation of this curious fact is that of all medical charities none is so overdone as this. I was formerly at the head of the department of a dispensary which sends an experienced accoucheur to the patient's home and furnishes gratuitously all necessary materials, drugs, and medicines, and still only an insignificant number of women avail themselves of this privilege, freely advertised by means of a placard placed conspicuously in the windows of the said dispensary. The number of confinements in the official Maternity Hospital of the City of New York has dwindled down to little above two hundred a year; and how could it be otherwise, when one commercial Crœsus after the other constructs palatial lying-in hospitals, when religious orders and lay societies vie with one another who can attract most patients, and when medical schools use every effort to obtain material for the instruction of their students?

The institution of midwives is a remnant of barbaric times, a blot on our civilization which ought to be wiped out as soon as possible. As America has led the world in establishing colleges for the education of women physicians, let it also form the vanguard in a war of extermination against those pestiferous remnants of preantiseptic days, midwives and schools of midwifery. The beginning has already been made in the State of Nebraska, where midwifery, like any other branch of medical practice, is exclusively in the hands of doctors of medicine, be they men or women. This law has been in force there for a number of years, and works well. To recognize midwives and give them a legal standing would be to go back to the times when stone-cutters, oculists, bonesetters, herniotomists, and other so-called specialists plied their trade under the eyes of the law.

On January 27, 1898, the Section on Obstetrics and Gynæcology of the New York Academy of Medicine passed the following resolutions:

"*Whereas*, Midwifery, or obstetrics, is an important branch of medical science and art;

"*Whereas*, Midwives are not recognized by the State;

"*Whereas*, Section 153 of the Laws of New York, 1893, Chapter 661, amended in 1895, prescribes penalties for any person who, without being then lawfully authorized to practise medicine within this State and so registered according to the law, . . . shall assume or advertise any title which shall show, or tend to show, that the person assuming or advertising the same is a practitioner of any of the branches of medicine;

"*Whereas*, Midwives by their gross ignorance and lack of cleanliness do great harm to parturient and lying-in women, and assume to administer potent drugs to them without the advice of a physician, and often treat sick women and children, and frequently are guilty of causing abortions:

"*Resolved*, That the Section on Obstetrics and Gynæcology strongly recommends the taking of immediate steps to secure the passage of a law providing for the supervision of all persons, not legally qualified physicians, now engaged in practising midwifery, and debarring from such practice all persons not proven to be competent and qualified; and also containing such provisions as, without conflicting with existing rights, shall tend to confine the practice of midwifery to qualified medical practitioners."[1]

CHAPTER X.

LYING-IN INSTITUTIONS.

LONG before having any direct influence on any hospital destined for the reception and care of pregnant, parturient, and puerperal women, the writer made himself the champion of these institutions, the very existence of which at that time was seriously menaced.[2] He treated this question at some length in a paper by which he sought and obtained the honor of fellowship in the American Gynæcological Society.

Prompted by Léon Lefort, of Paris, the International Medical Congress, assembled at Brussels in 1876, had adopted resolutions demanding the abolishment of large lying-in hospitals, and recommending that women be confined in the houses of midwives. I began by showing the fallacy of the statistics of Lefort, which had led to so sweeping a demand, and the danger of small private places where women were confined for a low stipend. At that time I had to admit, even in the best constructed and managed hospitals, a somewhat higher mortality—one and one-half per cent. against one per cent.—than in private practice. Since then the relation has been reversed. While the mortality in the cities has remained about the same, that in hospitals has been brought down to less than one-half of one per cent. The explanation of this fact is to be found in the strict adherence to antiseptic and aseptic rules in hospitals all over the civilized world, and the dereliction in this respect of private practitioners and midwives. This result is so much more wonderful when we take into consideration how handicapped the hospitals are in the race by having a majority of unmarried patients, in whom there is often a disturbing emotional element; a comparatively large number of primiparæ, in whom dangerous complications occur much more frequently than in pluriparæ; in having a number of cases brought in because they offer difficulties, and after ineffectual attempts at delivery have been made outside of the hospital, most of the time by more or less incompetent persons; in being chiefly used by the poor, whose vital forces are often impaired by debauch, disease, want, and worry; and in being to a great extent utilized as schools for the instruction of physicians and midwives, which used to be the chief cause of the so-called epidemics of puerperal fever.

---

[1] Garrigues, "Midwives," The Medical News, February 19, 1898.

[2] Garrigues, "On Lying-in Institutions, especially those in New York," Trans. Amer. Gyn. Soc., 1877, vol. ii. pp. 592–645.

The public is not aware of the greater safety of hospital confinements as compared with private practice. This fact is becoming more and more known in regard to general surgery and gynæcological operations, and it would also be so with reference to obstetric cases if it were not that general practitioners and midwives are interested in having women confined at home, and that most women dislike to give up home comforts and the care they may receive from relatives, friends, or nurses of their own choice. But cases in which capital operations, such as Cæsarean section or symphyseotomy, are to be performed, should in the large cities, as a rule, be transported, even during the labor, to a good hospital, where strictly aseptic material is at command and where skilled assistance is easily obtained at all hours. Furthermore, pregnant women who are too poor to secure a good accoucheur and a good nurse ought to prefer the hospitals, and so should those who are not strictly poor, but who cannot secure proper help at home. Several institutions, such as the Sloane Maternity, the Infant Asylum, the Mothers' Home and Maternity, offer private rooms for such patients, where they for a moderate remuneration can combine some home comforts with all the advantages of well-regulated hospitals administered by distinguished specialists and a trained staff of doctors and nurses.

Hospital practice differs essentially from that in private houses by the presence of a more or less large number of women who await their confinement, of women who are in labor, and of women who have recently been delivered. There is, therefore, special danger of one of these women infecting others, and special precautions are needed to prevent this evil. In such institutions much stricter asepsis is called for than in private practice, where, as a rule, antisepsis is sufficient. Corrosive sublimate being the most powerful antiseptic drug, and inexpensive, this is made use of extensively. It is used in a 1 : 1000 solution for cleaning the furniture, and in 1 : 2000 for the buttocks, the abdomen, and the thighs, as well as the mucous membrane of the vulva of the patient, and the hands of the doctors and nurses. It is convenient to have large bottles, casks, or tanks filled with a solution of one part in a thousand parts of water,—the *standard solution*,—which can be diluted with hot or cold water when a weaker solution is wanted. In the beginning I used also vaginal and intra-uterine injections of bichloride of mercury for different purposes, but, having seen several cases in which I thought this practice led to serious illness or death, I made a special study of the subject and collected twenty-three cases of death due to the intra-uterine and vaginal use of corrosive sublimate. From that time I substituted creolin one per cent. for the bichloride of mercury for injections.[1]

For disinfection of the hands and arms of the doctors and nurses, they should first be scrubbed for three minutes with a stiff nail-brush in very hot water, after having removed all rings and using soft potassa soap, which in itself is an antiseptic of considerable value. Next, they should be scrubbed in a solution of bichloride of mercury for a similar length of time. In order to take away the roughness caused by the corrosive sublimate, it is well to dip the hands subsequently into a one per cent. emulsion of creolin or lysol. For further safety it is well to wash the hands and arms with alcohol, but some institutions would object to it on account of its high price, and perfect results may be obtained without it. Some bacteriologists even belittle its value as a germicide, while others believe it to be the most reliable of all. The above enumerated parts of the patient's body are cleaned in a similar way, for which the tincture of green soap is very serviceable.

All substances coming in contact with the patient should be sterilized by means of moving steam under high pressure in sterilizers, which may be obtained from the manufacturers of hospital furniture.

---

[1] Garrigues, "Corrosive Sublimate and Creolin," Am. Jour. Med. Sci., August, 1889.

Instruments should be boiled for five minutes in a solution of crude carbonate of sodium,—that is, common washing soda,—a flat tablespoonful for each quart of water. The accoucheur and his assistants should don sterilized gowns and caps, as in surgical operations.

It is convenient to have a special *labor-bed*, upon which the woman is placed when she is somewhat advanced in the first stage. It should be of the height of an operating table, and the mattress covered all over with rubber cloth and a sterilized sheet. A pair of solid round wooden sticks should be placed in metal bows on the sides at such a distance that the patient can easily get hold of them and use them as support in bearing down. At the lower end there should be stirrups allowing the accoucheur to have the patient carried down to the end of the bed and lie in an easy dorsal position, with bent knees or outstretched legs, and free access to the genitals, or to have her turned over into the left-side position. It is also desirable to have a regular gynæcological table arranged so as to be able to place her in the elevated-pelvis position.

In the *delivery-room* the furniture should preferably be made of enamelled iron and glass. The room should contain all the drugs, instruments, apparatus, and bottles used in obstetric work. All bottles should be distinctly labelled. There should be a liberal supply of glass or agate ware dishes for the instruments and material used in obstetric operations, and dishes for keeping specimens for examination. There should also be a reliable faradic apparatus in good working order, an apparatus for transfusion and infusion, masks for administering chloroform and ether, gags, tongue-forceps, several hypodermic syringes, cylinders filled with oxygen, and bottles with the drugs in common use to relieve pain or combat shock, especially morphine, nitroglycerin, strychnine, atropine, tincture of digitalis, and camphorated oil. The room in which the women are delivered is in the Maternity Hospital called the "pony-room." I have in vain tried to get an authoritative explanation of the etymology of this term, and offer, therefore, the suggestion that pony here is to be taken in the sense of a small bed, a cot, just as it is used in speaking of a small horse and a small glass. I have found an analogy in Belgium, where it is customary—at least it was so forty years ago—to deliver a woman, even in private, on a narrow bed called *âne*, which means a donkey. A similar bed will probably have been called a pony in English, and the room in which it was placed in hospitals then became the pony-room.

In the construction of a lying-in hospital certain points deserve consideration. The ground should be healthy, not an old dumping-ground filled up with all sorts of offal, débris, and refuse, as so many places are in New York. Nor should the hospital be built over an old creek, for it is a common experience in New York that such houses are liable to be malarial. If possible, it should be built on high ground with free access of fresh air. It is best in temperate climates to have the wards so situated as to face east, west, and south. Rooms with exclusive northern exposure are apt to be chilly.

Since puerperal women have more abundant secretions than other patients, especially perspiration and lochial discharge, the air is loaded with animal effluvia. There should, therefore, be calculated more space for each patient than in ordinary hospitals, say from fifteen hundred to two thousand cubic feet. The best *ventilation* should be provided, in which respect, I think, architectural art has still much to learn. I have never yet seen a hospital or private house in which the air could be sufficiently renewed without opening the windows; but as drafts are sometimes injurious, the air should be led in through wire and flannel screens, distributing it over a large surface, and at the same time breaking it up into fine currents. It is not enough to rely on the circulation of air being produced merely by free communication with the outer air and difference in temperature. In a good hospital the fresh air should be driven in by mechanical force, especially fans kept moving in the lower part of the house, and distributing fresh air through conduits into each room. There should likewise be canals for the exit of the vitiated air, which to advantage may be led into a main shaft, where it is forced upward by heat or mechanical device. It is necessary to lead the fresh air from outside the building through closed shafts and pipes, and not take it from the cellar under the building itself.

The mode of *heating* calls also for close attention. There is hardly any doubt that an open fire giving the smoke off through a flue to the air above the house is the healthiest way of warming a room, but it entails much loss of heat and demands a great deal of care. The next best way of heating is by means of stoves, which are more economical; but in a large building great saving is obtained in regard to fuel and labor by having some system by which the heat is generated in one place, from which it is distributed through pipes. Either hot air, steam, or hot water may be used for circulating in the pipes. Hot air is apt to become too dry, and it is often difficult to obtain an even distribution of the heat, some rooms being cold while others are overheated. Steam and water only heat the air in the rooms, and do not introduce fresh air; but upon the whole steam-heating seems to be the most practical, and its drawbacks must then be counterbalanced by the ventilating apparatus.

There should be an abundant supply of hot and cold *water*, and the best system of trapping in order to prevent sewer-gas from entering the rooms through the drainage-pipes.

Old-fashioned privies with their putrefying animal matter contain a danger for parturient and lying-in women from which we must protect them. In modern lying-in hospitals there will, of course, be *water-closets* with running water, but it is not enough to partition them off from the ward with a few boards. They should be entirely removed and placed either in a separate building or on the other side of a corridor, or an intervening room in which there is a constantly open window. In the water-closets themselves there should also be an open window. The hoppers should be kept scrupulously clean, and for the disinfection of the pipes it is well daily to throw some cheap disinfectant into them, such as chloride of lime or sulphate of zinc. To use odoriferous substances, such as carbolic acid, thymol, or camphorette, for this purpose, is not to be recommended, as they are apt to conceal the danger instead of eradicating it.

Bedpans ought to be removed as soon as used, emptied into the water-closets, cleaned, and disinfected. Dressings ought to be collected in closed cans and burned.

Separation of Patients.—Women who are awaiting their confinement, the parturient and newly delivered, and patients with protracted diseases should be kept separate from one another. In the New York Maternity women who had no homes were often admitted as early as four months before confinement, and the service was then two or three times as large as it is now, so that there was a large number of practically well persons, whom it was particularly difficult to keep submitted to the strict disciplinary rules of the hospital. When one of these patients is taken in labor, she should be removed from the others, both for her own sake and for theirs. She should have quiet, and have special care, and the others should be spared the view of the sufferings which await them. To have patients with suppuration or other pathological conditions in the room in which parturition takes place and the newly confined women are kept, exposes others to infection.

Furthermore, sick puerperal women ought to be separated from the well. Even in the smallest lying-in institutions there ought to be a sick-room always ready for use. If there is no such place set apart, and a special room must be provided for isolating a patient when she is deemed to be dangerous to the other patients, the measure will not be resorted to often enough and early enough to yield all the advantages which might be derived from it. This does not mean that every patient whose lying-in period shows the slightest deviation from the normal need be separated from the others. All patients with a slight rise in temperature, with a little fetor of the lochial discharge, and with local pelvic inflammation, I left in the wards. The only kind of patients I removed were those affected with puerperal diphtheria, and they were transported as soon as the diagnosis was made. As a rule, a sudden rise in temperature to from 103° to 105° F. called attention to their dangerous condition. They were then taken to the sick-ward, where an inspection was made and showed the diphtheritic infiltration.

The sick patients must have their own day and night nurses who have nothing else to do but to watch them, feed them, nurse them, give them medicine, cheer them up, and make them feel as comfortable as their sad condition allows. They should be treated by other physicians, so that the chief, once having shown what is to be done, may leave the treatment in their hands. By good care even seemingly desperate cases may sometimes be saved through the devotion of assistants and nurses.

The sick-ward should, of course, have its own instruments, which never should be used for the normal puerperæ.

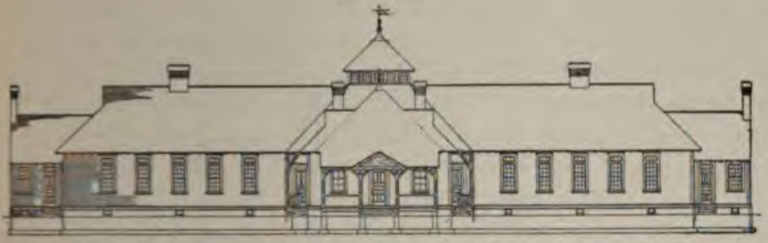
A regular and rapid *rotation* in the use of the wards is of great importance as a safeguard against infection in lying-in hospitals. Even before the new era in Maternity Hospital, when we used the wards in a hap-hazard way, we noticed that, as often as a ward was emptied, cleaned, and fumigated, the patients were free from fever for a week. I therefore introduced a regular rotation, each ward of six or nine beds being only used for one set of patients, and each patient staying only nine days, when she was transferred to the convalescent ward, in which she stayed a few days longer, unless some abnormality in her condition called for longer rest and treatment. Every time the last patient reached her ninth day the ward was fumigated, aired, and disinfected.

Special attention should be paid to the *laundry*. It is not enough to wash sheets, blankets, pillow-cases, and personal underwear after each confinement. If a patient is so sick as to make it likely or sure that she is suffering from puerperal infection and septicæmia, all clothes that she has used on her person or in her bed should be washed and disinfected separately from the linen used by the well women. In Maternity Hospital I had large casks holding all the bed-clothes from one patient filled with the undiluted solution of corrosive sublimate, one to one thousand, and the clothes immersed for an hour and washed separately before going to the laundry, where they were mixed with the other linen.

The New York Maternity Hospital.—In the year 1888 I had the pleasure of drawing the plan for the new building of the New York Maternity Hospital on Blackwell's Island, the details of which were arranged by Mr. Frederick C. Withers, architect, some of whose drawings I have his kind permission to reproduce in Figs. 230, 231, 232.

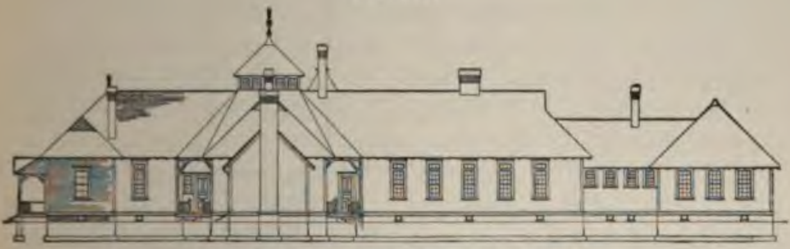
This building was an annex to Charity, now City Hospital, the [illegible] those who had been confined nine days ago or more, doctors, nurses, the drug-store, kitchen, and store-rooms were housed in other buildings, so that the new building should be used exclusively for parturient women and puerperæ delivered within nine days. Since the building was to be constructed on an island with an abundance of ground belonging to the city, I chose to give it the shape of a cross, whereby the wards were widely separated from one another and light and air had free access. I made the delivery-room the centre of the whole service, and had three wards, each destined for twelve beds, going out at right angles towards the east, south, and west. Contiguous with the south wing, but entirely separated from it, is an Isolation Department, composed of four separate rooms and a bath-room and water-closet.

FIG. 230.



The New York Maternity Hospital, Blackwell's Island. East elevation.

FIG. 231.



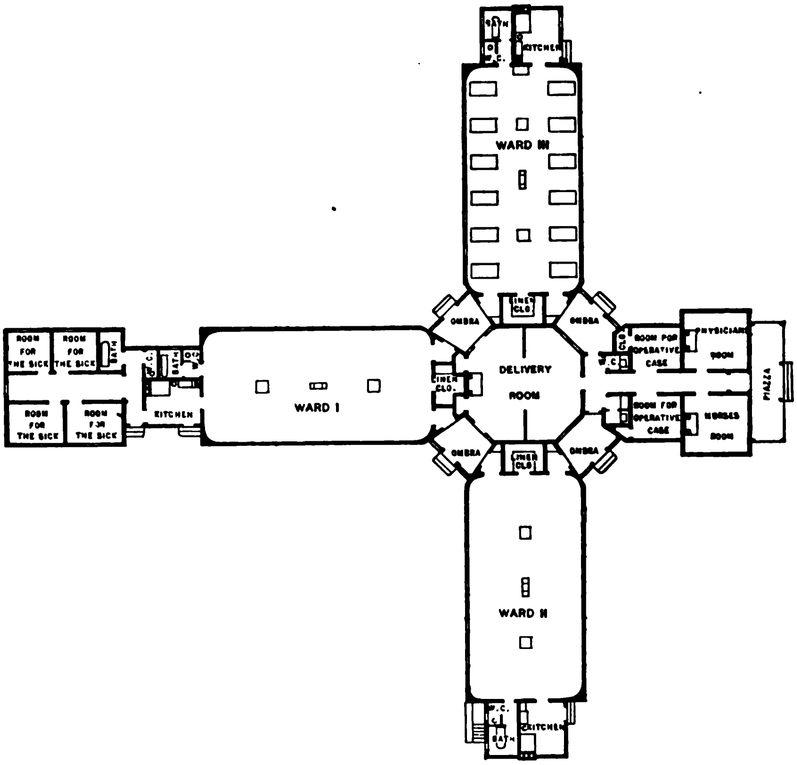
New York Maternity Hospital. North elevation.

At the opposite end of the building are two rooms for operative cases, an office for the doctor on duty, and a room for the head-nurse. Between the department for healthy women and the Isolation Department is a kitchen, and each ward has its own linen-closet and water-closet.

There is no direct communication between the wards and the delivery-room, but at each of the four corners of the latter is a so-called ombra, a space covered with a roof and having three doors, one leading to the delivery-room and two opening into the two contiguous wards. By this disposition no air from a ward can enter the delivery-room, and the attendants may either traverse the room or go around it, passing through wards and ombras without being exposed to rain and snow. After delivery the patient is transferred to the ward then in use.

I had planned the building so as to have the administrative department occupying the northern end, but a higher power turned it

Fig. 232.



New York Maternity Hospital, Blackwell's Island. Plan of ground floor.

ninety degrees, disturbing the whole orientation so that north became east, and so forth.

In the conduct of labor in a lying-in hospital the obstetrician should follow the rules of aseptic surgery. He and his assistants should wear sterilized gowns and caps, and all sheets, towels, and pads used should be sterilized by prolonged exposure to moving steam under pressure. All instruments should be boiled for five minutes in a solution of washing soda (a tablespoonful to each quart of water).

PART IV.—NORMAL PUERPERY.

Definition.—The puerpery, puerperium, or puerperal state is the period following labor. It has a distinct starting-point,—namely, the moment the after-birth has been removed from the maternal body,—but its end is not so well marked, and therefore its length varies, different authors placing the limit differently. According to etymology, —*puer*, a child, and *pario*, I give birth to,—a puerpera is a woman who has recently given birth to a child. The laity is inclined to make a special period of the time a woman stays in bed after delivery, which with most people means nine days. But this varies enormously. The Indian squaw does not take to her bed at all, but follows her tribe as soon as labor is over. The writer has known a poor unmarried woman who gave birth to her tenth child, and who had never rested more than one hour after delivery, when she returned to her hard work of washing clothes or scrubbing the floor. In the lying-in hospital in Munich, women are kept only five days after delivery. On the other hand, it is not rare for women who can take care of themselves to stay two weeks in bed, and some eminent accoucheurs recommend even a lying-in period of three weeks. The expressions "lying-in month" and "monthly nurse" show that in the public mind the puerperal state lasts a month. The author some years ago made a special study of the question of "Rest after Delivery,"[1] and came to the conclusion that the patient ought to be kept quietly in bed, alternately on her back and on her sides, until the uterus has diminished sufficiently to sink below the pelvic rim, and until all raw surfaces in the obstetric canal are covered with granulations or healed. The time a woman is kept in bed after labor varying so much, it cannot be used as a standard for the length of the puerperal state. French authors usually look upon the return of menstruation as the end of the puerperium, but this being based only upon the unnatural habit of women in that country of letting other women nurse their children, it hardly deserves recognition in a disquisition about the normal childbed. From a scientific stand-point we must say that the puerperal state extends until the time when involution is finished,—that is, until the genital canal and the abdominal wall have returned to their former condition, or rather have approximated it as much as they ever will, because a woman who has borne a child will never become entirely like herself as she was before pregnancy and labor took place. As we presently shall see, this retrograde and reparative process is not finished before sixty or seventy days, or even four or five months after childbirth.

---

[1] Garrigues, Amer. Jour. Obst., 1880, vol. xiii. pp. 845–864.

CHAPTER I.

CONDITION OF THE MOTHER.

While during pregnancy there was a strong current of nutritive substances going from the mother to the child, by which its body gradually was developed, after the end of labor the tide turns and there is a strong current of waste material going from the genitals inward, which explains the peculiar vulnerability so peculiar to puerperal women. The waste material produced by the process of involution chiefly finds its way out of the maternal organism through a peculiar discharge from the inside of the womb called lochia, an abundant perspiration, and the urine.

Temperature.—It is quite common for the newly delivered woman to feel chilly and even to shiver. A rise in temperature to 100° or 100.5° F. is so common that it must be regarded as normal. It is especially marked in the late afternoon, while in the morning the temperature is usually slightly below the normal. The rise is doubtless due to the combustion of effete material. Before the use of antiseptics higher temperatures were quite common after three or four days, and were attributed to the beginning milk secretion. This so-called *milk fever* has disappeared with the improved management of parturient and puerperal women. Higher degrees of temperature are mostly due to some inflammation, to retention of fæces or lochia, or to emotions; and their cause should be carefully investigated, in order to be able to meet all indications.

Pulse.—The frequency of pulsation diminishes to 70 or 60 beats in the minute, or occasionally it even goes down to 50 or 40, and the pulse not rarely has an intermittent character. This slowness is probably due to a diminution in the work the heart is called upon to perform by the elimination of the child, the closure of many channels through which the blood heretofore circulated, and the loss of blood during labor.

Perspiration.—The perspiration incident on the exertions of labor does not cease with it, but continues and even increases after its termination.

Respiration becomes easier after the expulsion of the child, its frequency varying between 12 and 24 per minute. In consequence of the diminished compression of the lungs, their capacity increases.

The *appetite* is diminished, while the thirst, in consequence of the loss of water through perspiration, lochial discharge, and increased urinary secretion, is more marked.

The *bowels* are constipated, which may be due to the administration of an enema before delivery, to the smaller amount of food taken, and to its composition, which does not leave much undigested residue.

The *urine* is increased in amount, at the same time that it contains less urea. On the other hand, it contains some albumin, and often sugar. The former is probably due to the destruction and absorption of much albuminoid tissue from the genitals, the latter to absorption from the breasts. The urine also frequently contains hyaline casts and epithelial cells from the different parts of the uropoietic system and numerous leucocytes.

It is noticeable that puerperæ, as a rule, do not feel so frequent a desire to urinate as before, an interval of twelve hours not being rare, unless orders are given to let the patient urinate or to draw the urine more frequently. This sluggishness may be due to the laxity of the abdominal wall, which allows great expansion of the bladder. Perhaps, also, the strong anteflexion of the uterus causes a flexion of the urethra. Often it is bruised and swollen from compression between the child's head and the symphysis pubis.

Lochia.—The lochial discharge consists at first of pure blood; after three or four days it becomes more serous for the next three or four days, and finally it becomes mucopurulent. According to this varying appearance it is called *lochia cruenta*, or *rubra*, *lochia serosa*, and *lochia alba*, *lactea*, or *mucosa*. But, while this sequence is the norm, there obtains considerable variability in respect to the character of the lochial discharge in women who otherwise are in good health. Especially it is quite common to see the discharge repeatedly become bloody again. Its duration varies also considerably, between two and six weeks. In those who do not nurse their children it is apt to last twice as long as in those who do. The fluid has a peculiar nauseous odor. It contains albumin, mucin, fat, cholesterin, and various salts. Its reaction is neutral or acid. Microscopical examination reveals red blood-corpuscles, pus-corpuscles, and epithelial cells in it. After two or three days numerous microbes are found in it,—single cocci, staphylococci, and bacilli. They originate partly from those found in the vagina before delivery, and partly they enter from without. In normal cases lochia taken from the interior of the uterus do not contain germs. When injected under the skin the fluid produces furuncles, and its retention in the cavity of the uterus or the vagina is apt to cause a rise in temperature. When it stagnates, it acquires a fetid odor, the saprophytes floating in the air finding a favorable soil in it for propagation. Its total amount is hard to ascertain, and the few who have tried to measure it have arrived at rather discrepant results, varying between one pound and three pounds during the first eight to eleven days.

Involution of the Uterus.—Immediately after the expulsion of the placenta the uterus forms a hard ball not mounting more than four finger-breadths over the symphysis pubis, but, the intense contraction subsiding, it rises to within an inch of the umbilicus, and is the next day often found an inch above this point. At first the contraction has an intermittent character, contraction and relaxation alternating with each other, but soon a permanent size is reached, and after that this alternation ceases and henceforth the uterus steadily diminishes in size. At the end of the second week the fundus, when raised up, is, however, still an inch higher than in the unimpregnated condition, and at the end of the third week it is yet half an inch higher than in the non-puerperal state. A corresponding diminution takes place in the lateral and anteroposterior dimensions.

The weight of the uterus decreases in a similar manner. Immediately after delivery it weighs from twenty-two to twenty-four ounces; at the end of the first week, from nineteen to twenty-one; at the end of the second, from nine to eleven; at the end of the third, from five to seven; and it does not reach its normal weight, which averages an ounce and a half, before the end of the second month. It appears from these figures that the uterus has lost but little in weight at the end of the first week, that the greatest diminution takes place during the second week, and that at the end of the third it is still three or four times heavier than the non-puerperal uterus.

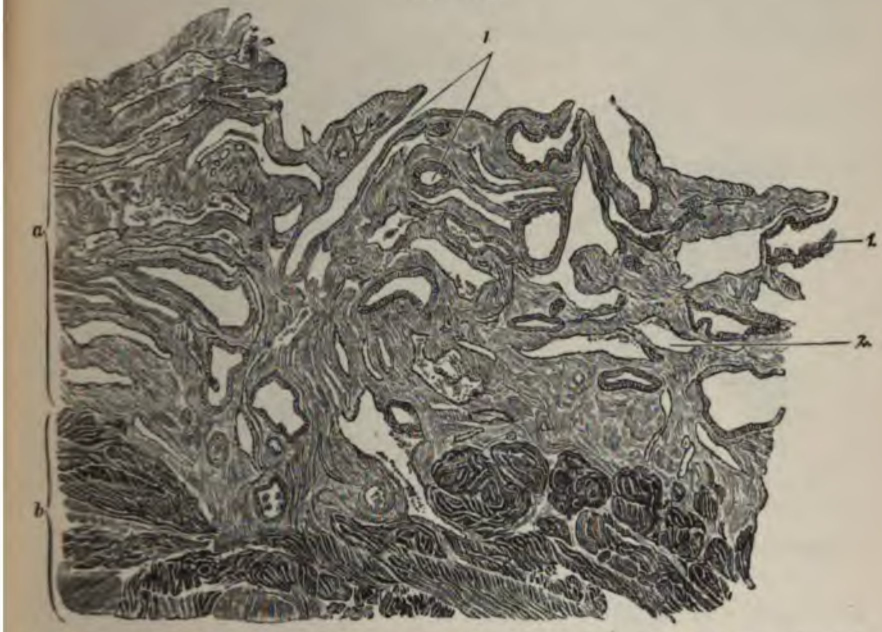
The immediate diminution in size following the expulsion of the placenta is due to muscular contraction and escape of some of the blood filling the uterine vessels, but the next day fatty degeneration and gradual absorption of the muscle-cells begin and continue until the end of involution. It has also been found that towards the end of pregnancy the muscle-cells contain large vacuoles filled with glycogen, which is pressed out by the powerful contraction following childbirth.

The separation between the ovum and the uterus takes place in the loose ampullar layer of the decidua (Fig. 233). Most of what is left is subsequently destroyed and the débris eliminated as part of the lochia. But the deepest parts of the decidua remain, and from the columnar epithelium of the bottom of the utricular glands a new layer spreads over the inner surface in the course of twenty or twenty-five days.

The placental site is rough and often distinguished by clots protruding from the sinuses. Some of the sinuses had already become closed towards the end of pregnancy. The others are now obliterated by blood-clots, which become organized by cell proliferation, starting from the endothelium and from leucocytes, and forming young connective tissue. The work of reparation is slowest in this place, so that sometimes the site is still recognizable four or five months after labor.

Immediately after the birth of the child, and still more so after the expulsion of the placenta, the uterus becomes strongly anteflexed, the fundus lying up against the anterior abdominal wall and the cervix following the direction of the vagina (Fig. 234). The cervix is long and soft and the os more or less torn. The contraction ring is well marked, but not the internal os, the lower uterine segment and the cervix forming a long tube with thin walls. The difference between the upper and the lower part of the uterus disappears, however, in the course of a few days, the contraction ring approaching the internal os more and more until it blends with it. On a section of a woman who died on the sixth day[1] there was no longer any difference between an upper and a lower segment, but the whole wall was three times thicker than before pregnancy. It had also receded nearly entirely below the pelvic brim. The internal os remains so soft that

FIG. 233.



The microscopical appearance of the inside of the uterus immediately after delivery. (Zweifel.) a, mucosa; b, muscularis; 1, opened utricular glands with columnar epithelium; 2, blood-vessels.

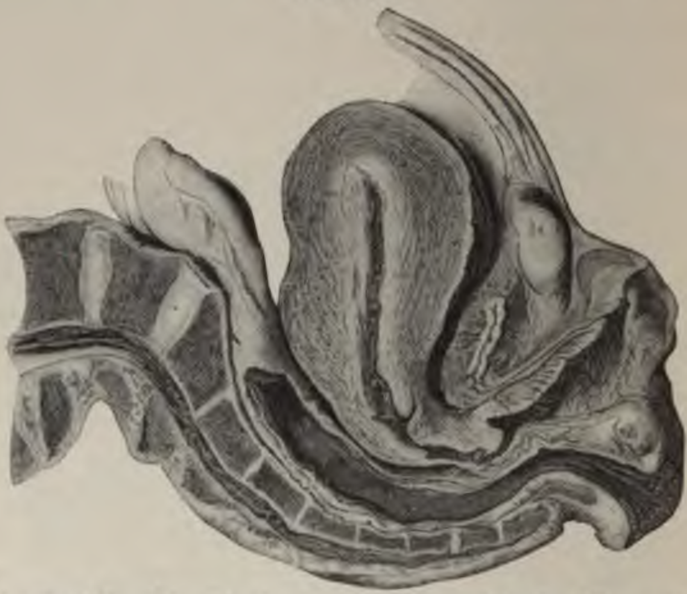
---

[1] A. H. F. Barbour, The Anatomy of Labor, Edinburgh, 1889, Pl. XI.

a finger may be passed through it till the end of the second week, and the external os remains open still longer.

The anteflexion increases during the first weeks of the puerperal state, so that the highest point of the uterus felt through the abdominal wall is no longer the fundus but some point of the posterior surface (Fig. 235). Later the uterus gradually returns to its normal shape.

Fig. 234.



Sagittal section of the pelvic organs of a puerpera on the second day after delivery. (Ahlfeld.)

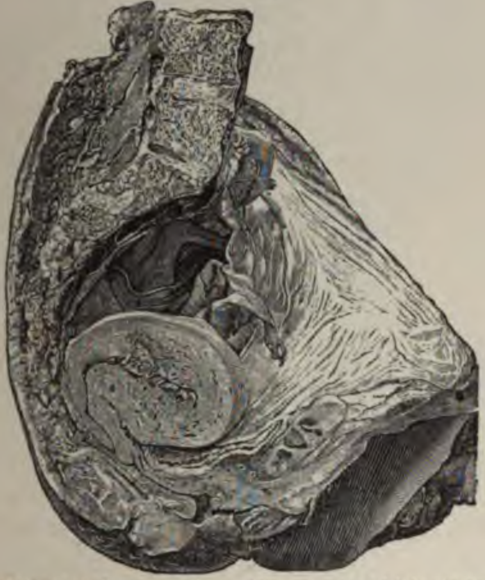
The involution of the vagina is slower and more imperfect than that of the uterus. When this canal has once been distended by the passage of a child, it hardly ever regains its original dimensions and resiliency, the difference being particularly marked at the entrance, which is nearly always more or less torn.

The hymen, that by coition had only been ruptured so as to form two or more flaps, in consequence of bruising followed by gangrene sustains a real loss of substance, its remnants shrinking to a few wart-like protuberances called *carunculæ myrtiformes*, one of which is nearly always found on each lateral aspect of the entrance to the vagina.

The labia majora remain more flaccid and often gaping. The abdominal wall is also slow to contract and never regains its former elasticity. The tears of the corium, which we have noticed during pregnancy as purple-colored streaks, leave white scars running more or less perpendicularly and marked by fine, close lines intersecting them at right angles. In that condition they are properly called *striæ albicantes.*

If the woman has not been carefully bandaged, gets up too soon, or resumes hard work while all the tissues are still soft and yielding, the aponeurosis of the flat abdominal muscles and the superficial fascia become thinned and stretched, so that the recti muscles separate from each other and the intestines are felt in the gap, and, as it were, right under the skin. Even if the thinning of the abdominal wall does not go so far as to produce such a diastasis, it is not rare that the abdomen protrudes more forward, while it is an exception to see it return entirely to its former shape.

FIG. 235.



Sagittal section of pelvic organs in puerperium. (Stratz.) Day of lying-in period unknown, but rather late. Uterus in pelvis, strongly anteflexed.

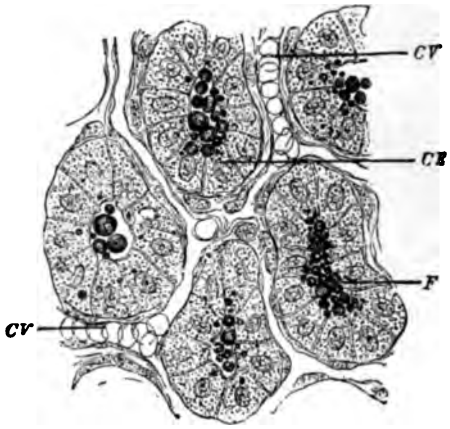
In some women the uterus sinks behind the symphysis in five days, but in most it takes about two weeks to do so. During the first three or four days the patient feels painful contractions of the uterus,—so-called *after-pains.* These are, however, much more common in pluriparæ than in primiparæ, and are, therefore, rather due to defective contractions than to too strong ones, a theory that is corroborated by the beneficent effect of ergot.

The uterine souffle, which during pregnancy was heard in the sides of the uterus, may in most cases be perceived for four or five days after delivery, a cogent proof that it is independent of the placenta.

It is not only the uterus and the external genitals that shrink after delivery; the whole body loses on an average a pound a day during the first nine days, and often this continues long after the woman is up and about, so that she regains much of her shapeliness which was lost during pregnancy.

The Breasts.—During the first few days the secretion of the mammary glands is small in amount, indeed often not sufficient to satisfy the hunger of the child. It is uneven, being composed of a thin serum with thick yellowish streaks, and continues to show the microscopical appearance of *colostrum* (Fig. 138, p. 96). About the fourth day the breasts become full, hard, and tense, and the secretion becomes even, thin, and of a bluish-white color, and is hereafter called *milk*. This is a fluid composed of nearly nine parts of water and a little over one part of solid substance. One thousand parts of milk contain 889 parts of water, 39.24 casein, 26.66 butter, 43.64 milk sugar, and 1.38 inorganic salts, especially phosphate of calcium. Milk contains all the substances needed for a complete diet,—albuminoids, fats, and hydrocarbons,—in a form that is easily assimilated. It is the natural food for the child during the first nine months of its life, and contains all the ingredients needed to build up its body during that time. The fat is formed in fine globules in the interior of the cuboidal cells lining the acini of the mammary gland, whence it enters their central cavity and is pressed by elasticity into the lactiferous ducts (Fig. 236), from which the child sucks it out by forming

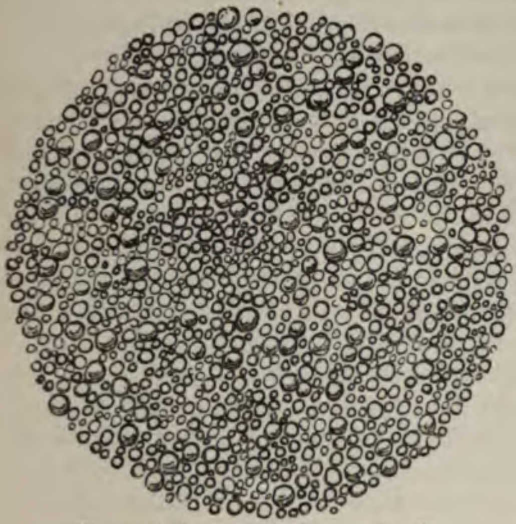
Fig. 236.



Acini of mammary gland during lactation. (C. Heitzmann.) *CE*, cuboidal epithelium; *F*, fat-globules, stained black with osmic acid, and seen both in the cells and in the central cavity of the acini; *CV*, connective-tissue frame with blood-vessels. Magnified six hundred diameters.

a vacuum in its mouth. Milk forms an even emulsion with very fine fat globules (Fig. 237). Colostrum contains, besides fat globules of very unequal size, colostrum globules, which are epithelial cells in fatty degeneration. It also contains albumin and coagulates by heat.

FIG. 237.



Microscopical appearance of woman's milk.

The mother's food has great influence on the composition of the milk, and drugs given her are found in it and thus reach the child she nurses.

Milk contains many staphylococci and even streptococci, microbes which must have found their way in through the canals of the nipples, but under ordinary circumstances they neither harm the mother nor the child.

✓

CHAPTER II.

THE CARE OF THE MOTHER.

THE woman who has recently given birth to a child needs a good deal of care, in order to prevent the change from a normal lying-in period to an abnormal one, and to restore her, as far as possible, to her pristine condition. Even in private practice pulse and temperature should be taken twice a day and recorded in writing. The best time for this is about eight o'clock in the morning and between six and seven in the evening. In lying-in hospitals the result ought to be recorded graphically, so as to enable the visiting physician to satisfy himself at a glance of the condition of the patients. Since the arrival of the doctor is apt to cause a little excitement, it is better to have pulse and temperature taken by the nurse.

On account of the perspiration pearling on the skin of the puerpera, she should be carefully guarded against draughts; on the other hand, she should have plenty of fresh air, the more so as evaporation of the lochial discharge vitiates the atmosphere, or at least makes it unpleasant to breathe and smell. If possible, I prefer in cold weather to keep an open window in a neighboring room rather than in that where the patient lies. The temperature of the room should be kept at about 70° F. The patient should be covered enough to feel comfortable, but not so much as to increase unnaturally the perspiration. The room should be kept light in daytime, and only too glaring a sunlight ought to be mitigated by pulling down the shades. There is no call for a darkened room. The puerpera should not be treated as a sick person, and most vital functions are benefited by light. During the night it is convenient and proper to have a weak flame burning, and to screen it from both mother and child.

In regard to diet, I find it pretty safe to satisfy the appetite of the puerpera. During the first twenty-four hours I let her take only milk, tea, coffee, beef tea, and oatmeal gruel. On the second day I add a couple of eggs or, if the woman desires it, soup with sweetbread or pigeon, or chicken fricassee. Then come broiled chicken, mutton-chops, and beefsteak, with bread and butter. Vegetables are not so easy to digest as the more albuminoid foods, and fruit sometimes causes the baby griping pains. Sweets are apt to sour on the mother's stomach, and had better be kept out of the diet till she is quite well.

As to beverages, the regimen must vary according to whether the mother is nursing her child or not. If she is, she should have plenty of fluid food. I order a plate or a cupful of milk, tea, coffee, chocolate, beef tea, mutton or chicken broth, or oatmeal or farina gruel to be taken every two hours, besides which she may drink plain water or mineral water *ad libitum*. Beer increases the secretion of milk and strengthens the nursing woman, but the writer has noticed that it sometimes causes a diarrhœa in the child, which cannot be checked until the tempting beverage is given up. If, on the other hand, the mother will not or cannot or may not nurse her child, she should drink as little as possible. Her bowels should be moved daily with a saline aperient, preferably sodium sulphate or phosphate, a heaping teaspoonful or more. I cover each breast with a layer of absorbent cotton, moistened with

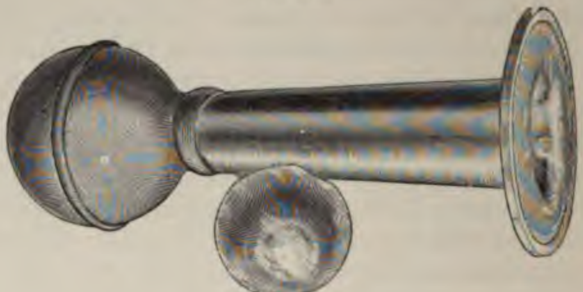
℞ Atropinæ sulphatis, gr. ij (12 centigrammes);
Glycerini, ℥ ij (60 grammes).

Outside of the cotton is laid a piece of gutta-percha tissue two inches greater in diameter than the cotton pad, and outside of the waterproof material comes the breast-jacket presently to be described, which in this case is put on as tight as possible and tightened daily when the breasts begin to shrink. The dressing remains undisturbed until the production of milk ceases, which takes eight or ten days.

As a rule, the mother should nurse her child. It is ordained by nature, and it is better for herself and her child. Suckling produces uterine contractions, the greatest safeguard against infection and subinvolution. If she leaves this function to another woman, the child will love the wet-nurse more than it will its mother, and if she brings it up on a bottle the child is rarely nourished so well and is much more liable to digestive disorders. But there are circumstances which make it impossible or unadvisable for the mother to nurse. If she has no nipples, or if instead of protruding they form a hollow under the level of the breast, there is nothing for the child to take hold of, and nursing becomes impossible. Serious diseases that have undermined the mother's constitution, such as cancer, tuberculosis, or serious cardiac trouble, should be looked upon as a barrier to lactation. This is not the case with syphilis. The child, having been built up by the mother's blood, cannot be injured by her milk, while it is criminal to expose another woman to infection from the child by nursing it. Sometimes the mother's engagements by which she earns her living are such that she cannot nurse the child. If for any reason it is known beforehand that the mother shall not nurse, then it is much better that the milk be dried up at once in the manner described above, for the breasts are much more likely to become inflamed if lactation is begun and then stopped after a short time.

If the mother is to nurse her child, this should be placed at the breast when the mother has rested a little and the baby has been bathed, say about two hours after delivery. In the beginning nursing is often a little difficult. The child has to learn to suck, and the mother has to adapt herself to it. She should lie a little turned to one side, and have the child placed parallel to herself at such a height that the mouth is on a level with the nipple. It is well to seize the child's sinciput and hold its mouth on to the nipple. It is also advisable to press a few drops of the contents of the breast into the mouth, so that the child gets the taste of the fluid. If the nipples are short, they may be lengthened by pulling on them with the thumb and two nearest fingers, or by applying to them a breast-pump with rubber ball (Fig. 238), by which a vacuum is formed. The mother must be taught how to depress her breast, so as to leave the nostrils of the suckling free for the entrance of air. The first few days the supply often is so scant that the child is not satisfied. Then it should be given slightly sweetened boiled water with a teaspoon, or, if that does not satisfy its craving, even boiled cow's milk in the proportion of one part to two may be added to the sweetened water. In the beginning both breasts will be needed, but when the milk production is well established the contents of one breast suffice often to still the hunger of the child, and then the two breasts should be used alternately. In the beginning the child should be put to the breast as often as it awakes, but soon a certain regularity should be established, so that the child nurses about every three hours, even if it be necessary for that purpose to awake it. Also in regard to sleep its education should begin early. Some children will sleep all the evening and be awake all night, which is very inconvenient for their attendants and may seriously interfere with the mother's well-being. By nursing them and playing with them in the evening hours, often a good night's rest may be gained for all concerned, only interrupted once or twice by the child's legitimate want of food.

FIG. 238.



A breast-pump.

The child should not be allowed to play with the nipple and fall half asleep and wake up indefinitely. Under these circumstances it should be kept awake by gentle shaking and reminded to suck.

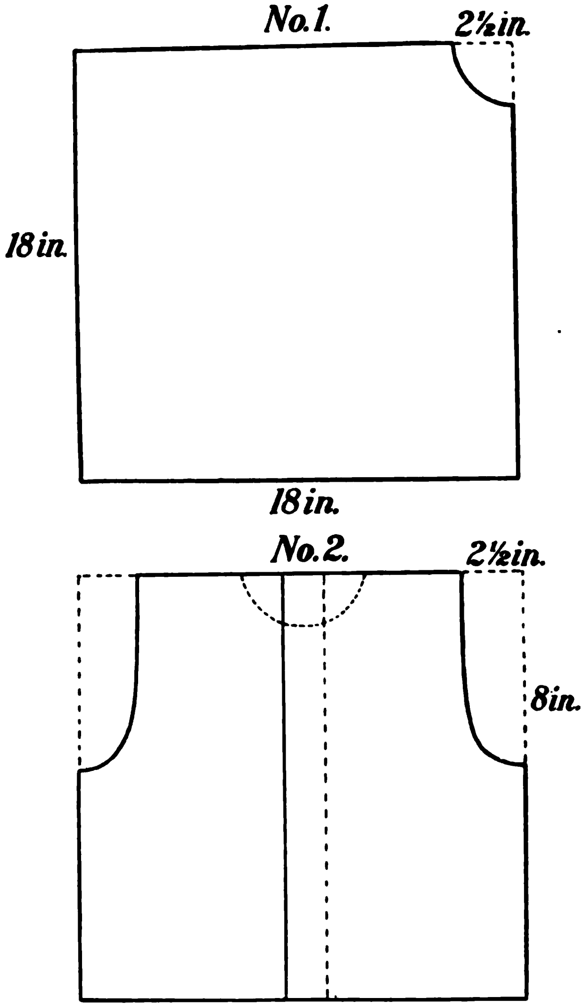
The nipples should be kept clean by washing them with plain lukewarm water or saturated solution of boric acid before and after each nursing; but only the softest material, such as absorbent cotton, should be used for this purpose, and the nipples should be wiped dry, so as to avoid maceration of the epithelium and excoriation.

When about the fourth day the breasts swell and become hard in consequence of the plentiful production of milk, I surround the chest by a breast-bandage. In Maternity Hospital we have these ready-made, composed of two layers of muslin sewed together. In private practice I cut them myself with a pair of scissors. I take a piece of unbleached muslin a yard long and half a yard wide, fold it in the middle by bringing the ends together, and cut out at the upper side a quarter of a circle with a radius of two and one-half inches (Fig. 239, No. 1). Next I place the bandage around the chest of the patient and notice how much the ends overlap. After having placed the bandage on a table, I make the ends overlap as much as before and cut out on each side a piece eight inches long and two and one-half inches wide when folded in the middle (Fig. 239, No. 2), the first piece cut off being used as a pattern for the second. The bandage (Fig. 239, No. 3) is now placed behind the back of the patient, who is first raised to a half-sitting posture, and then let down again so as to lie flat on her back. The flaps are brought under her arms and up in front towards the shoulders, and pinned together with large safety-pins from below upward, while the patient herself keeps the breasts upward and inward with her flat hands applied outside of the bandage. When the breasts are reached, a wad of cotton is placed between the two and the pinning continued until the level of the upper end of the breasts is reached. Then each flap is folded lengthwise so as to correspond in width to the posterior flaps between the notches for the neck and the arms, and finally the anterior and the posterior flaps are pinned transversely together with two small safety-pins (Fig. 229, p. 202). By lifting and equally compressing the breasts, this bandage not only affords great comfort to the patient but is an almost absolute protection against the formation of that painful and disfiguring disease, a mammary abscess. When the breasts become soft again and nursing is well established, about the ninth day, this bandage may be left off.

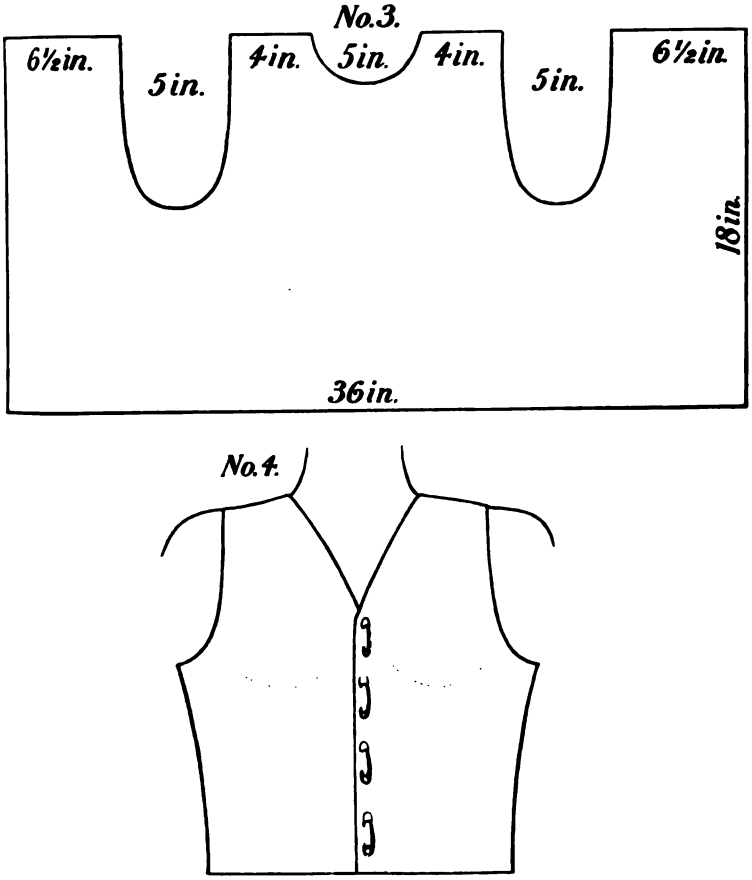
Before leaving this subject, I wish to add a word about the development and the name of this bandage, which has found its way in more or less correct shape, and sometimes under another name, into many books on obstetrics and nursing. At the earlier part of my service at Maternity Hospital I was surprised at the common occurrence of mammary abscesses, which I attributed to the way in which sore nipples and caked breasts were treated. On the 1st of October, 1882, I introduced a radical change in this respect. The use of breast-pumps, rubbing and kneading, that had flourished until then, was totally discarded, and instead I ordered even compression by means of a bandage just broad enough to cover the breasts. To this were soon added two shoulder-straps, and, seeing the beneficent effect in inflammation, I used this treatment soon as a preventive also, and in the skilful hands of the head-nurse, Miss Marion Murphy, the three pieces were blended into one, forming a kind of sleeveless waist, which, in honor of the said lady, I described under her name; but since the underlying principle and the original bandage were introduced by me, and since the name has given rise to the misunderstanding that this jacket had the same origin as the celebrated button used in intestinal surgery, I now give it my name, altho I thereby appropriate something that is an improvement on own work.

In some women the milk runs out, so that not enough is left the child. Then it may become necessary to give diluted cow's n

FIG. 239.



besides. In others the milk gives out after a few months, or t health suffers so much by nursing that it has to be discontin Under such circumstances the child must commonly be nouris artificially, as in most cases it is difficult to find a wet-nurse willin enter on service at so late a date. If there is milk enough, but mother does not want to be the only source of supply, she may be allowed to combine her own nursing with the administration of a couple of bottles of dilute cow's milk. Many prefer such an arrangement for the night. If there is breast-milk enough, the child should live on that exclusively for the first nine months of its life. Lactation may without harm be pushed a few months further, but it must be looked upon as an abuse when women of the lower classes, in order to avoid a new impregnation, continue nursing during the second year. This constitutes an unnatural drain upon the maternal organism which may have bad consequences.



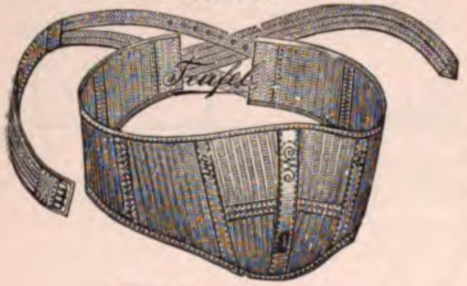
Garrigues's breast-bandage.

When the time for *weaning* the child has come, it should be done quite gradually in the course of eight or ten days by substituting every day one more artificial meal for each suckling. The transition is done best to slightly diluted cow's milk. Cow's milk, undiluted, should continue to be the staple food during the second year, but, besides that, the child may have zwieback soaked in milk, an egg, chicken-breast, or very finely cut rare roast beef or steak.

Returning to the lying-in period, the perineal bandage should be renewed three times a day, and also after each micturition and defecation. Morning and evening a douche-pan should be placed under the patient, and the external genitals with the nearest surrounding parts should be syringed with lysol (two teaspoonfuls to a quart of water), but the nurse should be strictly forbidden to touch the patient. If some blood-clot adheres to the hairs, she may wipe it off with absorbent cotton dipped in the lysol water. After eight days the medicated perineal pad may be omitted and a common sanitas pad or diaper used instead.

The abdominal binder should be tightened once every day, and when soiled it should be replaced by another. When the woman gets out of bed this binder becomes inconvenient, but she should for a couple of months use a well-fitting abdominal supporter. The writer has found that of Teufel (Fig. 240) particularly well adapted to obstetric cases, both before and after delivery.

FIG. 240.



Teufel's abdominal supporter.

As a rule, some mild aperient is needed to move the bowels. An enema of soapsuds may be given on the third day. Many women like the compound liquorice powder of the pharmacopœia, a heaping teaspoonful of which, stirred with a little water and taken in the evening, as a rule, is followed by a good movement next morning. For those who prefer a pill I usually prescribe the following combination:

℞ Podophylli resinæ, gr. iv (24 centigrammes);
Extr. belladonnæ alcoholici, gr. ij (12 centigrammes);
Extr. gentianæ compositi, q. s.
Ft. pil. no. viii. Sig.—A pill once or twice a day.

Before leaving the house I prescribe an ounce of fluid extract of ergot, of which a teaspoonful is to be given three times a day. It helps contraction, and thus indirectly becomes an antiseptic and may also combat after-pains. I leave likewise a prescription for Magendie's solution of morphine, six drops to be given if the woman complains of after-pains, and repeated, if needed, four times a day.

Quiet should reign in the lying-in room. With the exception of the very nearest,—for instance, the husband and the mother of the puerpera,—visitors should be kept away until she has been out of bed for a few days, and even then admitted only in small numbers and one at a time. All news apt to cause grief or anxiety should be kept back from her till she has regained more mental and physical strength. As a pastime, light literature may be indulged in after a few days, or the puerpera may do some light hand-work, such as knitting or crocheting.

A very important question, and one upon which the views of authorities vary considerably, is, How long should a woman stay in bed after delivery? In some institutions they do not keep normal puerperæ over five days. In most it is the routine practice to keep them in bed for nine days, and that this is the proper time is a very common idea among midwives and lay women in all civilized countries; and in this country, when a doctor is engaged for a "confinement," the understanding is that the remuneration agreed upon covers the day upon which labor begins and a visit on each of the following nine days. This may in so far be justifiable as in most cases involution has then proceeded sufficiently that the woman may leave her bed without harm, and in public institutions some rule is necessary for the regular occupation of the wards. In private practice the time of getting up should not be regulated by days, but by the condition of the woman.[1] We have seen above how slow the uterus is in regaining its normal size and weight. Special investigations with curved and straight sounds have been made, in order to find directly the influence of the erect posture on the shape and place of the puerperal uterus, and it was found that it increases the anteflexion and anteversion and the protrusion of the abdomen, while the uterus as a whole is pushed backward.

While gravitation tends to combat these conditions when the woman lies on her back, in the erect posture it works under the very best angle—that is to say, perpendicularly on the long axis of the uterus—to make them worse. It gets a good purchase by taking hold of the enlarged body which forms the long arm of a lever placed horizontally, while the cervix represents the short arm of the same placed almost perpendicularly. We must, furthermore, remember that the uterus and all the parts of the body that serve to support it are soft, flexible, and yielding after childbirth. From these premises I infer that the upright and sitting postures should be avoided until involution has progressed so far that the uterus has receded from the anterior abdominal wall and returned to the pelvic cavity, where it is much better protected. This is easily ascertained by external palpation. If the fundus is still above the pelvic brim when the physician discontinues his visits, he should, among other good advice he gives in taking his departure, tell the patient to stay in bed for so many more days as he deems it will take before the uterus has sunk down behind the symphysis pubis.

---

[1] Garrigues, "Rest after Delivery," Amer. Jour. Obst., October, 1880, vol. xiii., No. 4.

If the patient went to another extreme and stayed three or four weeks or longer in the recumbent position, there would be danger of the normal anteflexion and anteversion turning into the always abnormal retroflexion and retroversion.

Whenever the patient is allowed to get up, it should be done cautiously. She is weak from lying in bed, from suffering, from loss of blood, lochial discharge, and milk, and in consequence of a more or less restricted diet. She is, therefore, apt to faint. I like to let her first be helped over on a lounge, upon which her head is raised to a higher position while the body still remains horizontal. The next day she may sit on an easy-chair, with the feet down for an hour. The following day she will stay up two or three hours, and thus gradually return to the common way of living. She should not walk up and down stairs before the end of three weeks, and not go out before the end of a month. During a similar length of time she should not pick up anything from the floor, such a sudden movement having occasionally caused an embolus to be carried from a uterine sinus and lodged in the brain, resulting in apoplexy and death.

Marital relations ought not to be resumed before the genitals in the main have returned to their normal condition,—say six or eight weeks after childbirth. That conception is possible much sooner is proved by a case published by a German physician, in which coition resulting in impregnation took place four days after delivery. But the poor woman should be given a rest before she is called upon to develop another fœtus in her body.

The writer is aware that few are so situated that they can follow all these rules. The poor servant-girl leaves the hospital within a fortnight, and either must do general housework or take a position as a wet-nurse, in which she is expected to give every attention to the child for whose benefit she is engaged, and not to take too much care of herself. The poor married woman must attend to her household duties. But that is no reason why those who can afford it should not have the best of care, based on scientific principles. Long experience in hospital and dispensary services has taught the writer how much more commonly all kinds of gynæcological diseases, even including cancer of the uterus, are found as sequels of childbirth among the poor than among the wealthy.

CHAPTER III.

SIGNS OF THE PUERPERAL STATE.

In cases of clandestine childbirth, the medical expert is sometimes asked whether a woman has recently borne a child. During the first two weeks this question can, as a rule, easily be answered, while after that time it becomes more difficult. The signs to which the physician should pay special attention are a gaping vulva; the softness and lack of elasticity of the labia majora; tears on their inside, at the fourchette, of the labia minora, or the entrance of the vagina; a gangrenous condition of the hymen, or parts of it being swollen, torn, abraded, or covered with granulations; the lack of elasticity and the presence of lesions of the vagina; a long, soft, and torn cervix; the open os internum; the enlarged, anteflexed uterus; a rough placental site; the lochial discharge; purple-colored abdominal streaks; the laxity of the abdominal wall; the presence of a linea fusca; milk in the breasts; and the dark color and large size of the areola.

Some of these signs allow us even to say more or less definitely how many days have elapsed since the child was born. Thus, colostrum is rarely found after the first four days; all the wounds will granulate within eight days; the internal os becomes impermeable for the finger in ten or twelve days.

Permanent Changes caused by Childbirth.—As a rule, it can also be diagnosticated whether or not a woman at a more remote period of her life has borne a child. In most cases the vulva is more or less open in the parous woman. The fourchette is often torn and the seat of white cicatricial tissue. The vaginal entrance commonly is wider and shows cicatrices. The hymen is not only torn, but has sustained a loss of substance, reducing it to carunculæ myrtiformes. The vagina is wider and more smooth. The cervix, as a rule, shows small nicks, if it is not outright torn. The external os forms a transverse slit. The abdominal wall is likely to be flaccid and show white, more or less perpendicular cicatrices with fine transverse lines. The breasts are more hanging, the areola darker and larger, and sometimes there may be found one or more cicatrices after a mammary abscess. But occasionally even the most experienced observer may be in doubt whether he has to deal with a nullipara or a woman who has had a child.

CHAPTER IV.

THE CONDITION OF THE CHILD.

After birth the *temperature* of the child sinks rapidly to 95° F., and then rises gradually until after twenty-four hours it reaches the normal temperature of grown-up persons. After that its temperature averages 97½° in the morning and 98½° in the evening.

The change in *circulation* has already been described in connection with the two fetal systems of circulation (page 47). The irritative cause that makes the umbilical arteries contract and stop pulsating is cold, which is proved by plunging the child, after the circulation in the umbilical cord has ceased, into a warm bath, when the arteries begin again to pulsate. That is why the ligature of the navel-string should be examined and, if necessary, tightened before bathing the child.

The *respiration* is frequent and superficial. The child breathes up to 50 times a minute, and the amount of expired air is forty-five cubic centimetres. The air enters very gradually into the different lobuli of the lungs, which remain so atelectatic that only very small portions of them will float in water, while larger invariably fall to the bottom (Ahlfeld), which has an important medico-legal bearing. This test, upon which much stress is laid in deciding the question whether a child breathed before death or not, is therefore reliable only when it is positive,—that is to say, if parts of the lung float, it proves that the child has respired before dying; but the sinking of the pieces does not prove that it has not breathed.

The respiration has often a stertorous sound, which is probably due to aspired mucus or liquor anmii.

The *pulse* of the new-born child beats about twice as frequently as that of an adult. It averages 137 in a minute during the first two months, 128 from the third to the sixth month, 120 from the seventh month to the end of the year, and 118 up to the twenty-first month. Its frequency varies much under the influence of movements, crying, and external impressions. It is less frequent in strong than in puny children. In healthy children it is strong and regular. It cannot be taken at the wrist, however, but may be counted at the heart.

The first few days a lively *desquamation* takes place on the skin. At first the child has a reddish color, but this disappears in a few days. The head of the new-born child is congested. At the place that corresponds to the vagina there is some swelling, due to œdema, and even small extravasations of blood under the skin or under the galea aponeurotica, but this condition disappears within twenty-four hours. The conjunctiva is injected, and shows sometimes suggillations, which soon are reabsorbed.

Fæces.—Shortly after the birth of the child the meconium is expelled from the rectum. This dark-green, almost black, tarry mass is followed by brown fecal matter, which becomes lighter and lighter in color until about the end of the first week it is of light-yellow color. It is largely composed of bacterium coli commune, which probably plays the *rôle* of a ferment to accomplish the decomposition of the milk while the salivary glands are yet little developed. The glycogenic ferment is found only in small quantity in the parotid, and is absent from the other buccal glands and the pancreas. During the first week starchy substances are, therefore, an inappropriate food, which only fills the intestine to no purpose. The odor of the infantile fæces is nauseous and acid, but does not suggest any putrefaction.

At the birth of the child the bladder contains only about two fluidrachms of *urine*, and its secretion is slow. Quite frequently the urine is not evacuated before the second day. From the second to the tenth day, till there is a freer flow of fluid from the kidneys, these are often the seat of the so-called *urinary infarction*, a deposit of orange-colored uric acid in the straight canals, whence it is carried out through the ureter, bladder, and urethra, and stains the diaper. The urine is light straw-colored, acid, and has a specific gravity of 1005–1007. It contains little urea, uric acid, and phosphates, but some albumin and sugar.

During the first three or four days the child loses in *weight*, the total loss amounting to seven or eight ounces, which is accounted for by the expulsion of the meconium, the urinary secretion, and perspiration. By the ninth or tenth day this loss has been repaired, and the child has the same weight as at birth. From that time on it grows steadily in weight and size. At the end of four months its weight is doubled, and at the end of a year trebled. During the first four months the child gains on an average an ounce a day, from the fifth month only half an ounce or less, but in the second year, when more substantial food is given, the weight increases again more rapidly, so that at the end of sixteen months it is four times that at birth.

The child *sucks* by adapting its hollowed tongue to the lower half of the nipple, closing the lips all around it, and producing a vacuum by means of inspiration. A special centre for this act has been found in the medulla oblongata.

In the beginning the child *sleeps* much, sometimes four or five hours at a stretch, and its sleep is interrupted only by sucking. Later it lies more and more awake, and gradually develops an interest in its surroundings, especially moving objects. It has all its *senses*, touch and taste being particularly keen, sight and hearing soon become distincter, whereas it seems that smell is slower in its development.

The *umbilical cord* dries up and gradually becomes detached from the abdomen. In most cases it falls off on the fifth day, leaving a circular granulating surface, which heals in the course of twelve to fifteen days, and forms an uneven, somewhat retracted cicatrice.

The red color of the skin does not always go over to the normal yellowish-pink color. Quite frequently—in seventy-five per cent. of children—it is followed by a decided yellow color, implicating not only the skin, but also the mucous membranes, especially the conjunctivæ, and constituting a true jaundice, *icterus neonatorum*. Of the many theories advanced to explain this phenomenon, the most plausible seems to me to be that the pigment comes from destroyed red blood-corpuscles, and that the pressure in the umbilical vein diminishes so much after the birth of the child that the bile enters the blood. The fact is that analytical chemistry has proved a surplus of hæmoglobin in the blood of the new-born. This icterus being so common, and the children affected by it appearing to be in good health, it cannot be looked upon as a disease, but as part of the normal changes taking place in the child after birth. It lasts three or four days, and disappears without any medication.

CHAPTER V.

THE CARE OF THE CHILD.

A NEW-BORN infant needs little air, but much warmth. Cradles have mostly been given up. The child should first be laid in a basket with soft pillows under its body and head, and should be covered with a woollen blanket or even a light feather-bed. This basket should not be so large that it cannot easily be carried from one place to another. The bedclothes may be protected against wetting by a rubber sheet, but the infant should not have any clothes of such material, as they interfere with the free evaporation and cause chafing. When the child grows out of its basket, it should have a crib. It should lie by itself and not in the mother's bed, in order to avoid the constant inhalation of the air vitiated by respiration and evaporation from the maternal body, and the still greater danger of the mother in her sleep rolling over it and smothering it. It should be lightly dressed, as described above. No kind of swaddling-bands should interfere with the free movements of its limbs. Nor is it necessary to carry it on a mattress in the idea that its vertebral column needs a special support.

If cradles have been abandoned as useless, and perhaps even injurious to the nervous system, it is irrational to place the child in a rocking-chair and rock that, which has the same effect as a cradle. Upon the whole, the greatest care should be observed to avoid fostering habits in the child which are either injurious to itself or burdensome to its attendants. The child's education should begin at birth, and the first aim should be to accustom it to regularity and good habits. It is wonderful to see how soon habits are acquired by the new-born infant, and if they are not led in a proper direction the child soon becomes a tyrant who exhausts the strength of its mother or nurse and disturbs the whole household. The more the child is left alone the better it is for all, which by no means implies neglect of proper care. If the child has not urinated when I see it the day after its birth, I introduce a silver probe smeared with a little vaseline, which invariably is followed by a rush of urine. Likewise, if it has not passed meconium, which is much rarer, I introduce the little finger well anointed through the anus, which, if there is no organic malformation, is followed by the desired effect. The cause of these retentions is only an agglutination of the epithelium of the canals concerned, just as two leaves in a new book may stick together. Once separated, the epithelial layers remain so, without giving rise to any retention.

The child should be bathed morning and evening in a bath-tub large enough to permit free movements of its limbs. The temperature of the water should the first few weeks be about 98° F., but after the first month it is well gradually to make it less warm, until 88° F. are reached. Cold baths cause too great disturbance in the economy of the infant. The cold frightens it, and the reaction is too stimulating for it.

When the infant is taken up every three hours, its diaper should be changed. If it is soiled, the dirt should be wiped off and the bottom and the genitals washed with lukewarm water, but after washing these parts they should not be wiped, in order to avoid excoriation. Soft linen or muslin should only be gently pressed against the skin, so as to soak up the moisture. When dry, the parts are dusted with some fine powder, such as talcum.

The absorbent cotton surrounding the navel-string comes off in the bath, and is then renewed. After the cord has fallen off a fine piece of linen or muslin smeared with white vaseline may be placed on the granulating surface until it is healed.

The most important question is how to feed the child. We have already entered on this subject in speaking of the care to be given to the mother, and there said that with few exceptions a mother should give her child suck. Even if in consequence of hemorrhage she is temporarily weak, she will soon recover, so that her feebleness need not preclude her nursing her child. We have also seen that nursing should be done at regular intervals, and great cleanliness observed in regard to the nipple.

How much a child drinks can only be found out by weighing it before and after each meal. This has been done by different obstetricians with somewhat varying results. During the first month the child takes about twenty-one ounces daily; during the second, about twenty-four ounces; during the third, about twenty-eight ounces; and from the fourth to the ninth, about thirty-two ounces.

When the mother has a sufficient supply of milk, the child needs from fifteen to twenty minutes to satisfy its hunger.

If the mother cannot nurse her baby, the best substitute from a purely physical stand-point is a *wet-nurse*, because her milk has practically the same composition, and all the troubles of artificial feeding are avoided. Sometimes the nursling may even be better off with a strong, healthy wet-nurse than if he were nursed by the product of the breasts of an anæmic, nervous mother. But in general there are many objections to a wet-nurse. If a married woman, without being forced to it, deliberately deprives her own offspring of her milk in order to sell it to another woman, who can afford to pay her well for it, she shows deficiency in the strongest of instincts—the mother's love for her offspring. If the nurse is unmarried, she usually owes her condition to immoral or immodest impulses, which we would dread to see pass over to our child in consequence of having imbibed her milk. All wet-nurses, married or unmarried, feeling their own importance, are apt to become selfish, exacting, and imperious, which gives rise to conflict with other domestics or even with members of the family, and disturbs the peace of the household. The child, like another animal, concentrates its love on the person that feeds it, so that there arises a feeling of estrangement from its mother. In New York wet-nurses are also so expensive that few can afford to employ them.

In the choice of a wet-nurse the physician must first of all ascertain that she is healthy, and especially that she is not tainted with syphilis or tuberculosis. He should, therefore, inspect as large a part of her body as practicable, paying particular attention to cutaneous eruptions, alopecia, swollen glands at the neck, above the elbows, and at the groins. The throat should be examined for mucous patches, and, if feasible, also the anus and genitals; but most wet-nurses refuse such searching examination. Under all circumstances he must carefully examine her lungs, using both percussion and auscultation.

Having found her healthy, he should turn his attention to her breasts. The mammary glands should be well developed. She should have good nipples. When compressed, a breast should spurt the milk in a jet. He should place a drop under the microscope, and ascertain that the field is full of closely-packed fat globules of an approximately even size. He may even collect her milk in a test-tube, in which, upon standing, there should be not less than ten per cent. of cream. He should insist on seeing her child, in order to ascertain that it is well nourished and shows no sign of hereditary syphilis. Everything else being equal, he should prefer a person between twenty and thirty years of age. He should not overlook signs of habitual drunkenness, irritability of character, uncleanliness of person, or slovenliness of attire.

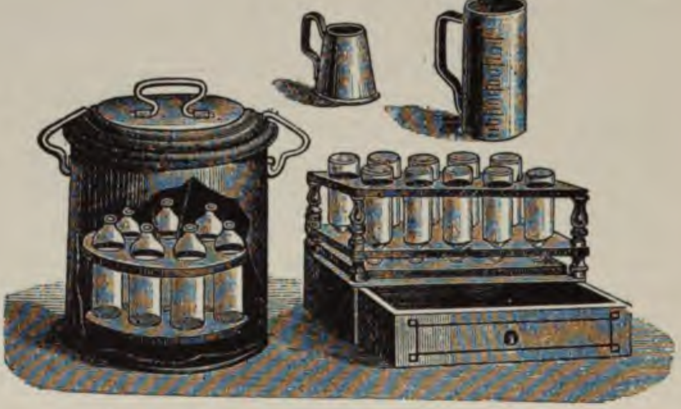
If the mother cannot nurse her child and no wet-nurse can be obtained, we are reduced to *artificial feeding*. The milk of the ass and the mare is nearest to woman's milk in composition, but not easily accessible. Goat's milk is too fat, and offers no advantage over cow's milk. We are, then, as a rule, compelled to use cow's milk, which is rather different from woman's milk, and ought, therefore, to be modified. It contains more casein, and often more fat, and, on the other hand, less sugar. The casein forms larger coagula, and is, therefore, less easy to digest. In large cities there are establishments where cow's milk is changed according to prescription, but this product being necessarily expensive, it is only accessible to few, and the large majority must modify their cow's milk at home as best they can.

Cow's milk should be diluted with water and sweetened, and, in order to prevent it from getting sour, it should be boiled, to which time-honored rules, since the introduction of bacteriology, has been added the demand that it should be sterilized,—that is, that all microbes in it should be killed. Perhaps the last is not so important as may appear at the first glance. Bacteriology itself having taught us that even mother's milk as it flows from the breast often contains saprophytes, staphylococci, and even streptococci, no means having been indicated for sterilizing that, and experience having shown since time immemorial that a child thrives better at the human breast than on any other kind of food, it may be questioned whether the bacteria of cow's milk are any more deleterious to the infant. But this sterilization having been made very simple and practical by the invention of Soxhlet, it is easy to obtain sterile milk. His apparatus (Fig. 241) consists of a metal frame with seven holes, in each of which is placed a bottle filled with the modified cow's milk. A similar apparatus has been constructed here in New York by Dr. A. Seibert, and is sold in the drug stores. Each bottle has a rubber stopper, which is put on loosely so as to allow the air to escape. The frame with the filled bottles is placed in a kettle with water. After boiling five minutes the stoppers are pushed down into the necks of the bottles, and the closed bottles boiled for forty minutes longer. Then the frame is removed from the bain-marie and kept in a cool place, preferably an ice-box. When the child is to be fed, one of the bottles is warmed slightly, as cold food causes stomach-ache. It should have a temperature of about 95° F., which practically may be ascertained by pressing the bottle against one's cheek, when it should feel neither hot nor cold. As will be seen, all the food for the day is prepared at once, and only so much warmed as is needed for a meal.

By the prolonged boiling the casein in the milk forms, however, coagula hard to digest; and some prefer, therefore, to expose it to a temperature of only from 140° to 160° F. for a similar length of time, which is called *pasteurization*.

Recently two prominent pædiatrists of New York have, however, raised their voices against both sterilized and pasteurized milk, declaring that by exposure to heat the milk becomes a bad nourishment and gives rise to rickets and scurvy. On the other hand, the Rockefeller Institute reports that much of the milk brought to New York is overfilled with bacteria, and often contains the germs of typhoid fever, diphtheria, and other dangerous diseases. After all, it may, therefore, be the best to come back to what our mothers and grandmothers did, and just boil the milk for a few minutes. At the same time every effort should be made to instruct the farmers about the proper care of cows and the manipulation of milk.

FIG. 241.



Soxhlet's sterilizer.

A certain number of microbes is unavoidable. A leading dairyman has informed me that we must not expect to have milk in New York that contains less than fifteen thousand bacteria in each cubic centimetre. But often this number is doubled, and, as stated, dangerous pathogenic microbes are found among them.

During the first month cow's milk should be mixed with twice as much water, and one-half of a teaspoonful of milk sugar should be added to each bottle. During the second month equal parts of milk and water may be given; during the third and fourth, two-thirds of milk, then three-fourths, and as soon as the child can digest it the milk should be given undiluted. Instead of plain water it is better to use barley water for diluting the milk. This is obtained by boiling the cereal with water for several hours, or by using "prepared barley," a product found in the groceries, which needs only five minutes' boiling.

If the child has a tendency to constipation, I use oatmeal instead of barley and molasses instead of sugar, or add a pinch of bicarbonate of sodium for each bottle. If, on the other hand, there is looseness of the bowels, rice may be substituted for barley.

Dr. A. Seibert has given the judicious advice not to determine the composition and amount of food by the age, but by the weight of the child, and he has devised the following table.

ARTIFICIAL INFANT FEEDING.

		Amount of			Time of Feeding.			
Weight of Child in Pounds.	Size of Bottle.	Milk.	Gruel.	Sugar.	Interval.	In 24 Hours.	6 A.M. to 6 P.M.	6 P.M. to 6 A.M.
6, 7, or 8	3 ozs.	1 oz.	2 ozs.	½ teaspoonful.	1 bottle every 2 hours.	8 bottles.	6 bottles.	2 bottles.
9 or 10	4 ozs.	1½ ozs.	2½ ozs.	½ teaspoonful.	1 bottle every 2 hours.	8 bottles.	6 bottles.	2 bottles.
11, 12, 13, or 14	5 ozs.	2½ ozs.	2½ ozs.	¾ teaspoonful.	1 bottle every 2½ hours.	7 bottles.	5 bottles.	2 bottles.
15 or 16	6 ozs.	3½ ozs.	2½ ozs.	¾ teaspoonful.	1 bottle every 2½ hours.	7 bottles.	5 bottles.	2 bottles.
17 or 18	7 ozs.	5 ozs.	2 ozs.	1 teaspoonful.	1 bottle every 3 hours.	6 bottles.	5 bottles	1 bottle.
19 or 20	8 ozs.	All milk.		1 teaspoonful.	1 bottle every 3 hours.	6 bottles.	5 bottles.	1 bottle.

Some recommend that salt be added to the composition, and, since cow's milk is deficient in this respect, the advice is based on a rational principle.

With such a guide at hand, it would seem not to be difficult to bring up a child artificially, but everything hinges on the quality of the cow's milk, and that again depends on the health and food of the cow and the cleanliness with which it is kept. If the cow is healthy and, especially, free from tuberculosis, if it is kept in a clean stable or on good pastures, fed exclusively with grass or hay, its milk prepared according to the above rules will probably agree with the infant; but such conditions will rarely be found. The vast majority are obliged to buy their milk of the milkman, who himself perhaps does not know anything about the cows from which the milk originates. Cabbages and beets are objectionable as food for cows with whose milk babies are nourished, and still more so are swill and draff. There is, therefore, danger that the milk is vitiated from the very beginning. For mercenary purposes the farmers or the dealers are apt to dilute the milk with water, and in this way often local epidemics of typhoid fever have been traced to a pump or a well, the water in which was contaminated by admixture with the drainage from privies. Whenever possible the milk from one cow should be used, which is easy in the country. In cities the milk should be bought directly from the milkman and not from a grocer, in whose store it is exposed to the emanations of many substances.

By the addition of water to the milk in order to reduce the percentage of albumin, that of fat and sugar becomes much too low, which may, however, be remedied by adding cream and milk sugar. Such a mixture is the following:

℞	Cream,	℥iij (from milk that has stood overnight);
	Milk,	℥ii;
	Water,	℥x;
	Milk sugar,	ʒiij.

Another difficulty arises in régard to bottles and nipples. The bottle should not be larger than the size indicated in the table, and should be kept scrupulously clean, and so should the nipples. They should be of plain black rubber, and they must neither let pass too much nor too little milk. In the first case the child is choked, in the second it gets tired of sucking. As a rule, three holes burnt with a red-hot needle will give the proper amount of milk. When not in use they should be washed and kept in plain water. No bottles with glass tubes should be used, as they cannot be kept clean.

While being fed, the infant should lie on its back with the head a little raised. The bottle should be held or placed so that the bottom points upward and the nipple against the tongue. In this way the child sucks with ease and does not fill its stomach with air.

Condensed milk, as a rule, contains so much sugar that it is unfit for feeding infants.

Finally, we have *artificial foods*. They are usually condemned, but I must say that in my own experience I have often obtained success by substituting one of them when milk caused diarrhœa. One decided advantage they have over most milk is that the manufacturer can himself survey the cattle which he uses and regulate their food. I do not see any advantage in such preparations as are only meant to be added to milk, the great difficulty being to get good milk, but there are several of these foods which only need to be mixed with warm water. A good preparation of this kind is *Nestle's Food*, which is prepared in Switzerland from the best of cow's milk and wheat in which the starch by heat is changed into dextrin. It forms a chamois-colored powder, one part of which is boiled with ten parts of water until in about ten minutes the mixture makes an even fluid, which is left to cool off. Mothers must, however, be warned that when the meal has an odor like old cheese it is decomposed and unfit for food. When in good condition it has a pleasant sweetish odor, like the cake called "ladies' fingers."

This decomposition is not so likely to take place in products made in this country, and which, therefore, may reach the consumer in a fresher condition. I have been well satisfied with *Horlick's Malted Milk* and *Reed and Carnrick's Lacto-preparata* and *Soluble Food*, which only need stirring with hot water. When the child does not thrive and gets intestinal disturbances, it is necessary to change its food. This applies even to mother's milk and wet-nurse milk, and so much the more to artificial food.

In general the mother should nurse her child for nine months. If she is strong and her milk good, the period of lactation may even be protracted to the end of the first year of the child's life. But then the child should under all circumstances be *weaned* and have more substantial food, and often, as we shall see later, her milk-supply gives out or becomes insufficient long before the end of this time.

CHAPTER VI.

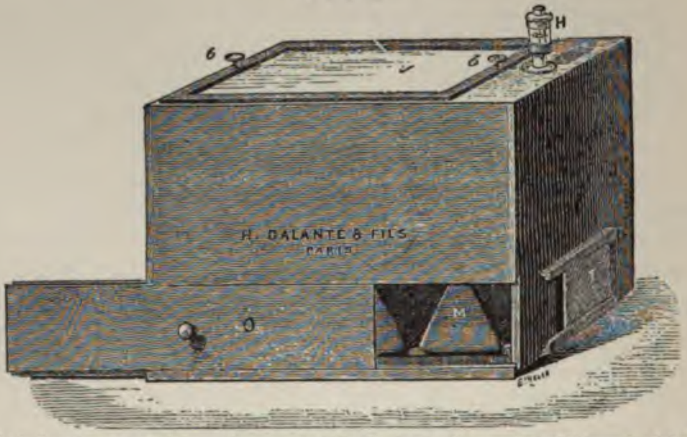
CONGENITAL WEAKNESS.

PREMATURE or particularly weak children require special care. It has been questioned whether it be wise to take so much trouble in rearing a puny being that perhaps may remain weak all its life, a burden to itself and others; or if it would not be better, without going so far as the Spartans, who killed the weak new-born children, at least to refrain from taking special measures to keep them alive. In the author's opinion, here as always our rule should be to save and prolong life, and therefore every effort should be made to rescue these poor little beings. Victor Hugo, the greatest French author of the nineteenth century, tells us that he weighed two pounds when he was born, and only survived thanks to the utmost maternal care.

Such weak children are not only deficient in weight and size, but they move their limbs with slowness, the respiration is shallow, and their cry feeble. Sometimes they have not strength enough for sucking or cannot even swallow. The mortality among them is enormous. To combat it we must keep them warm, feed them, and try to strengthen them. It is well to rub them all over with lukewarm cod-liver oil, cover them, body and head, except the face, with a thick layer of cotton batting held in place with a roller bandage, and place them in a basket between three hot-water jugs, one on each side and one at the feet, resting on a feather bed and covered with a warm but light blanket or quilt. Several times a day they are rubbed all over with warm alcohol and water or bathed in the same.

The late Dr. Tarnier, of Paris, introduced in 1880 a great improvement in the treatment of premature and weak children by the invention of the *incubator* (Figs. 242–244).

FIG. 242.

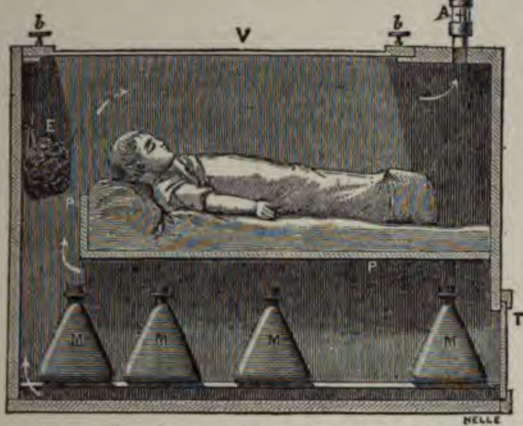


Tarnier's incubator, exterior. (Tarnier and Budin, l. c.) O, opening full length of box closed with a board that can be pushed to either side; M, so-called monk, a bottle of earthenware; T, cover over opening at end of box, shorter than aperture which admits air; V, glass cover; *b b*, buttons by which cover is easily lifted; H, wheel revolved by escaping air.

This apparatus consists of a wooden box divided into an upper and a lower compartment communicating with each other (Fig. 243).

In the lower are hot-water bottles. In the upper lies the child, and in the space uniting both hangs a wet sponge. The air enters through the door *T*, is heated by passing over the hot-water bottles, rises into the upper compartment, absorbs humidity from the sponge, and escapes through the tube *A*, in which is suspended a fine metal wheel, with wings, the movement of which is proof of the air circulating freely. The apparatus contains also a thermometer, by which the temperature is measured. When the incubator is to be used, three earthenware bottles (Fig. 244) full of boiling water are placed in the lower compartment and the door is closed. In half an hour the air rises to the temperature of 88–90° F., and the child may be put in place. If the temperature in the box rises higher, the glass cover should be opened a little for a few minutes. Two hours later a fourth bottle with hot water is introduced, and thereafter one bottle at a time is emptied and filled again with hot water every one and a half or two hours. The child should be dressed as we have described above.

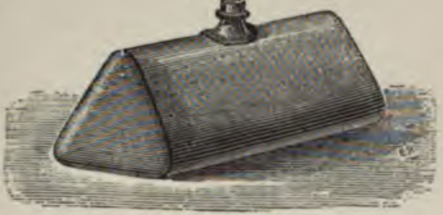
FIG. 243.



Tarnier's incubator, interior. E, wet sponge; P, partition between lower and upper compartments; A, tube for escape of air; T, M, V, *bb*, as in Fig. 242.

Every hour or two, according to the degree of weakness of the child, it is taken out, cleaned, and fed.

FIG. 244.



Hot-water jug.

For these weak little children the milk of the mother or a wet-nurse is by far the best food. If the child is too weak to suckle, the milk should be pressed or pumped out and given to it with a teaspoon. If the child nurses, it must be weighed before and after, in order to ascertain that it gets enough, for which purpose very delicate decimal scales are needed. The amount should, however, be very small, only between two and four fluidrachms at a time, the weaker it is the less, as too much food causes intestinal disturbances, which may become fatal to the weak creature. If human milk cannot be secured, cow's milk must be used, still more diluted than prescribed for a healthy baby and in the same small quantity as human milk. The smaller the quantity given each time the oftener it should be repeated, and not less than twelve times in twenty-four hours.

If the child is so weak that it cannot suckle, or the food regurgitates, it should be fed by the method called *gavage*, which likewise was introduced by Tarnier. It consists in laying the child on its back and introducing a soft-rubber catheter (No. 14 or 16, French) to the root of the tongue, when the child itself instinctively draws it to the upper end of the œsophagus. From here it is easily pushed into the stomach. The catheter enters about six inches. Some prefer to lead the catheter through the nose. To the other end of the catheter is fastened a little glass cup, which holds two fluidrachms. The milk is poured into this bulb, and sinks by gravity down into the stomach of the infant. When the proper quantity has been introduced, the catheter should be withdrawn rapidly, as otherwise the milk is apt to follow it.

When the child improves it is alternately nourished by gavage and put to the breast, until finally it is strong enough to suckle well.

By means of the combined use of the incubator and the gavage it has been possible to raise children after a uterogestation of only six months.

If the circulation is defective, a very cautious massage may be of advantage. The skin is rubbed and the muscles are kneaded a little two or three times a day.

ABNORMAL DIVISION

PART I.—ABNORMAL PREGNANCY.

CHAPTER I.

MULTIPLE FETATION.

§ 1. **Superfecundation.**—If a mare is covered within a short interval by a stallion and a jackass, she may give birth to two colts, one of which is a horse and the other a mule. This is due to superfecundation,—that is to say, after a fruitful connection with one animal the mare was again impregnated by the second. It is not unlikely that a similar event may happen to a woman, but it is hard to prove. The fact that a negress gives birth to two children, one of which is a negro and the other a mulatto, proves only that she has had intercourse with a white man, but it does not prove that she also has had intercourse with a negro, because children sometimes take almost exclusively after one of the parents. It is, therefore, possible that both children may have been engendered by the same white man, one getting all the racial traits of the mother and the other being a mixture of the two races. It would, therefore, not be sure that a superfecundation had taken place. Likewise, if a white woman gives birth to a white child and a mulatto, it is certain that she has had intercourse with a black man, but it is not proved that she also has had intercourse with a white man, since the two children might be engendered by the black father, one following exclusively the mother's type and the other showing the blending of races. But since two ova may be loosened simultaneously or within a short interval, it is not at all unlikely that they might be fertilized by contact with spermatozoids derived from two different fathers.

§ 2. **Superfetation.**—If ovulation stands in causal connection with menstruation, and if ova continue to be loosened after pregnancy has begun, which, as we have seen above, is unlikely, the question arises if such an ovum due to a following menstruation can be fecundated, a condition which in contradistinction from superfecundation is called superfetation. What has led to the supposition of such a possibility is the fact that in twin pregnancies one fœtus may be much less developed than the other, and that one twin may be born considerably later than the other, but this may be, and probably is, due to an arrest of development of one of the twins. After the coalescence of the decidua vera and reflexa, which takes place from the end of the third month, it is evident that a meeting between a spermatozoid and an ovum becomes an impossibility; but even long before that time it is likely that the swelling of the decidua around the apertures of the tubes becomes so great as to oppose an insurmountable barrier, and at the other end of the uterus there is another barrier formed by a large plug of thick mucus filling the cervical canal.

§ 3. **Common Multiple Fetation.**—Apart from the question of superfecundation and superfetation resulting from repeated intercourse with the same or different individuals, a single coition may result in the development of two or more fœtuses. One Graafian follicle has been seen to contain two ova, and two or more Graafian follicles may rupture at the same time. Finally, a single ovum may contain two or more germinative vesicles, which become fertilized and develop separate fœtuses; or a single germ may by scission be the origin of multiple fetation. Heredity and racial differences have some influence in this respect. In some families the recurrence of twin pregnancies is a frequent event, and the woman who once gives birth to twins is more apt to do so again than another woman. Fruitful races, like Hebrews, Russians, and Italians, seem to possess a predisposition to multiple fetation. But upon the whole this occurrence is so rare and so often gives rise to disturbances during pregnancy or complications during labor that it must be looked upon as an abnormal event. Only one birth in eighty-nine is a twin birth. Triplets are found only once in about eight thousand confinements, and quadruplets once in about four hundred thousand. Five children at once are still rarer, and the largest number ever recorded by medical men is six.

If a woman has a double uterus, she is more apt to get twins, and superfecundation or superfetation could more easily occur than in a single uterus. In such a case there would also be two deciduæ veræ, while under all other circumstances there is only one. In a single uterus the multiple fœtuses may be found in one or more ova. If there is only one ovum, there is also only one reflexa; and even if there are more ova, if they are engrafted near one another, they may all be covered by the same reflexa; but if the implantation takes place with a greater interval, each ovum has its own reflexa.

As to the chorion, it is single if there is only one ovum, but if there are several each has its own chorion. Each fœtus has also its own amnion, but in course of time the partition between the two may become absorbed, so as to form one cavity, or, if the twins are developed through scission of one germ, the formation of the amnia may be defective, just as the fœtuses themselves may be imperfectly separated. Whether a twin pregnancy is developed in one or two ova can, therefore, be decided by examining the partition between the two fœtuses. If there is none or only a double layer of amnion, the twin pregnancy has developed in a single ovum; but if the partition besides contains two layers of chorion, and perhaps two layers of decidua, the two fœtuses have developed in two separate ova.

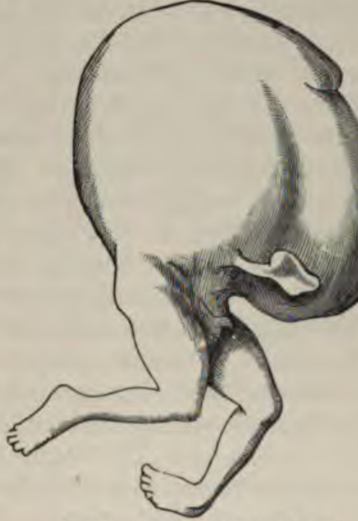
If there are two ova, there may also be two separate placentæ, but they may be more or less grown together. If the ovum is single, there is only one common placenta for both twins.

Twins developed in one ovum are often remarkably alike in size, features, and mental faculties.

As a rule, each fœtus in multiple fetation weighs less and is smaller than an average single child, but taken altogether they weigh more than when there is only one.

In a common ovum the navel-cords may become so entangled that both fœtuses die. One twin may be developed at the cost of the other, so as to be larger. One may be so compressed by the other that it dies and becomes mummified, thin, and flat,—a so-called *fœtus papyraceus*. Beside a normally developed twin, there may be another who has no heart and is nourished through the other twin. This anomaly, called *acardiacus* (Fig. 245), is found only where the ovum is single. It is due to the allantois of one of the fœtuses covering all or nearly all of the decidua serotina. The blood-pressure in this one becomes so much greater than in the other that the circulation in the latter becomes reversed. Heart and lungs and more or less of the body atrophy, and the pressure in the umbilical vein often gives rise to considerable œdema of the subcutaneous connective tissue.

FIG. 245.



Acardiacus. (Von Franqué, Sr.)

Sometimes one ovum contains an abnormal amount of liquor amnii (*hydramnion*), while the other is normal.

The sex in twins varies. In more than one-third of all cases the two are of opposite sex. Next in frequency come two males, and the rarest combination is that of two females.

Diagnosis.—In most cases the diagnosis is not made before the birth of the first child, when it becomes an easy matter to feel through the abdominal wall that the uterus contains another child, and vaginal examination reveals the formation of a second bag of waters. Before delivery it is by no means an easy matter to diagnosticate the presence of two fœtuses in the uterus. Unusual discomfort, dyspnœa, œdema, a size of the abdomen which is larger than that corresponding to the period of gestation, and wide-spread fetal movements may, in a general way, lead us to suspect the presence of a multiple fetation. Sometimes a distinct furrow may be seen running between the two fœtuses. It may be possible to feel distinctly the two heads or more limbs than correspond to one child. Auscultation may perhaps solve the doubt. It is, however, not enough for a diagnosis that the accoucheur hears the fetal heart pulsate with different frequency on different points of the abdomen, because the pulsation of the same heart may vary considerably from one moment to the other. In order to be conclusive, the auscultation must be performed simultaneously by two persons with practised ears, and even then the experiment ought to be repeated. If the two at the same time get a different number of pulsations, there must be two hearts. The writer has been deceived by palpation in a case of footling presentation, feeling both legs and what he took to be the skull through the vagina and another head under the liver. As a curiosity I may mention that the mother all her life had the habit of drawing up her legs and crossing them like a Turk, and her child occupied exactly the same position in her uterus, the breech resting in the left iliac fossa and the legs being crossed over the cervix. If heart-sounds are audible, and vaginal examination proves that the head is easily compressible and its bones freely movable, or a prolapsed pulseless cord is felt, it is evident that there is one living and one dead child. Very rarely two bags may be felt simultaneously, which also is certain proof of multiple pregnancy. Triplets can hardly be diagnosticated before delivery.

Prognosis.—The prognosis is less good in multiple fetation than in single pregnancy. The woman is more apt to suffer during pregnancy. Labor, as a rule, comes on before the time. The uterine contractions are often weak. Frequently operative interference becomes necessary. There is danger of post-partum hemorrhage, renal disease, eclampsia, or puerperal infection. The children are smaller and weaker, usually the mother has not milk enough to nurse them, and, as a result, we find an enormous mortality among them during the first year, which is still more applicable when the number exceeds two.

CHAPTER II.

THE DEATH OF THE FŒTUS.

Symptoms.—It happens not infrequently that the fœtus dies in the mother's womb. The first sign that calls attention to such a condition is the cessation of fetal movements, especially if it follows unusual strength and frequency of motion, but sometimes the fœtus keeps so quiet that for a day no movements are felt by the mother, although it is alive. After the beginning of labor the movements are rarely felt. The same incertitude may obtain in regard to the heart sounds. When the fœtus dies the heart ceases pulsating, but the fœtus may change its position in such a way that the sounds which have been heard before are no longer audible, and still the child may be alive.

When the fœtus dies, certain changes take place in the mother which have more or less diagnostic value. Her breath may become offensive. She may have dark rings under the eyes. Her face may become pale. The breasts may shrink. She may have fever, and even shiver. She may be mentally depressed. She does not increase in size, and it is even asserted that she loses from four to six pounds in weight. Often she has a sensation of a heavy body rolling in her abdomen when she moves. It has also been contended that the presence of acetonuria is a sure sign of the death of the fœtus, but the writer has found it present with a live fœtus and absent when the fœtus was dead. During pregnancy the uterus has a higher temperature than the vagina, the living fœtus being a source of heat. But after the death of the fœtus the temperature in both is the same. A sure sign of the death of the fœtus is found in an abnormal mobility of the bones of the cranium.

After its death the fœtus is sooner or later expelled from the body of its mother by abortion or premature labor, which, as a rule, takes place within two weeks after the death of the fœtus. During this time the fœtus undergoes certain changes. The red blood-corpuscles are dissolved, forming a red serum, which pervades its whole body and also imparts a dark bloody color to the liquor amnii.

Etiology.—The death of the fœtus may be due to injury. When during pregnancy the uterus rises into the abdominal cavity, the fœtus becomes exposed to injury through the abdominal wall, such as goring with the horn of an infuriated bull, kicks with the heavy boot of a no less brutal man, stab-wounds, or shot-wounds. I have seen the gravid uterus taken for a fibrocyst of the uterus, or even an ovarian cyst, and punctured by the surgeon in performing laparotomy, which may necessitate the removal of the fœtus; or, even if the ovum is intact and the wound properly stitched, in most cases ends in abortion.

Another class of injuries is inflicted through the vagina and the cervix, in order to bring on abortion, either legitimately by the accoucheur in the interest of the mother or criminally by abortionists.

In most instances the death of the fœtus is due to some disease of the mother, especially acute diseases accompanied by high temperature, such as pneumonia, typhoid fever, small-pox, or Asiatic cholera; poisoning with lead, phosphorus, or bisulphide of carbon, a substance used much in industry as a solvent for vegetable oil and rubber; pernicious anæmia; inflamed kidneys with eclampsia; and, most of all, syphilis in the mother, the father, or both.

Certain drugs, such as ergot, gossypii radicis cortex, oleum hedeomæ, oleum sabinæ, permanganate of potassium, or the binoxide of manganese, oleum rutæ, oleum tanaceti, tinctura cantharidis, tinctura hellebori nigri, strychnine, etc., are apt to produce abortion, and are often taken by women for this purpose.

Treatment.—If the death of the fœtus is brought about by internal causes, a purely expectant treatment is indicated until the fœtus is expelled. What is called for thereafter will be discussed in the next chapter, in treating of abortion.

If the death of the fœtus is due to a wound, such as goring with the horn of an animal, the case must be treated according to the general rules of surgery. The prognosis in such cases is better than one would expect. The late Robert P. Harris collected fourteen cases with nine recoveries.

CHAPTER III.

INTERRUPTION OF PREGNANCY.

§ 1. **Abortion.**—Abortion, or *miscarriage*, is the interruption of pregnancy before the child is viable. As we have seen above, this is at the end of six months of uterogestation, which thus forms a natural limit between abortion and premature labor.

Frequency.—There is no means of ascertaining how frequently abortion occurs, but it is doubtless quite a common event. Some estimate that one abortion corresponds to every eight or ten confinements, while others think it happens twice as often. Many abortions, doubtless, pass without anybody, not even the woman concerned, knowing that she was pregnant. Menstrual irregularities, which are so common in recently-married women, are probably often due to incipient pregnancy and its untimely interruption. The writer has while treating a gynæcological patient accidentally seen an ovum thrown off at the end of the second week after coition without the patient knowing that she was pregnant or had aborted, there being no symptoms whatsoever to call her attention to it.

Abortion is most common in the third month of pregnancy, and is observed with diminishing frequency in the second, fourth, fifth, and sixth months. Perhaps it is more frequent during the first and second months, but passes unnoticed; when the fœtus is larger, this, of course, cannot happen.

The chief symptom of abortion is hemorrhage from the uterus, which precedes, accompanies, and follows the miscarriage. When abortion actually occurs, clots are discharged, but in some cases nothing is observed, so that the patient is in doubt whether she has aborted or not. When a woman who usually menstruates with regularity has skipped a period and then is seized with cramps and passes clots, the probability is great that she has aborted. If the entire ovum or part of it or the fœtus itself is expelled and seen, there is no longer any doubt; and in cases of expected abortion the physician should, therefore, give strict orders that all clots or shreds or anything that resembles part of a body shall be kept for his examination. The smallest twig of a villus of the chorion examined under the microscope is sufficient to make the diagnosis that it comes from an ovum, while a tissue composed of the large decidual cells only proves that the patient is pregnant, but not that the uterus contains an ovum, which may have developed in an abnormal place.

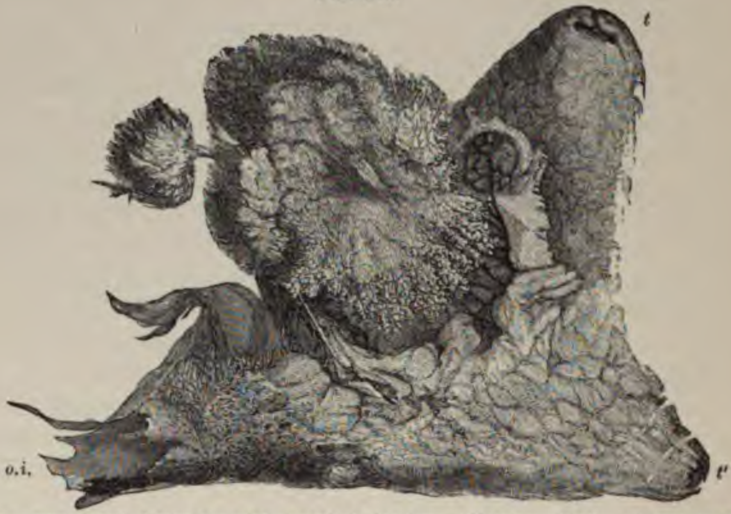
The loss of blood may be so great that the patient becomes faint, loses consciousness, or even dies. The hemorrhage may last for days, weeks, or months, and in these protracted cases, even if it is moderate, it weakens the woman considerably.

In most cases there is some pain, which is described as being cramp-like, and is due to painful contractions of the uterus. Backache is also a common symptom. Often the patient complains of nausea, or vomits and yawns.

On vaginal examination the uterus is found enlarged, soft, and, as a rule, either retroflexed or anteflexed. The os is more or less patulous, sometimes sufficiently so to admit the finger. Often the ovum may be felt projecting from the os, or, if the fœtus has been expelled, the umbilical cord may hang out from the os. In other cases the os is closed. Nearly always there is a more or less profuse bloody discharge from the uterus. If the fœtus is macerated, there may be an offensive purulent discharge. If general septicæmia has developed, the pulse is small and rapid, and sometimes the temperature is elevated. Under such circumstances there may also be weakness, nausea, vomiting, and a yellowish color of the face. In a case of this kind the writer saw repeated epistaxis and the formation of a large retro-uterine hæmatocele, which led to a fatal termination.

In very early pregnancy the entire ovum may be expelled at once, and the remaining decidua be so insignificant that it will take care of itself and cause as little trouble as at the end of pregnancy—*complete abortion* (Fig. 246). In other cases the reflexa is expelled with the ovum, and torn off from the vera, which remains. In others, again, blood accumulates between the chorion and the reflexa, and separates the ovum from the reflexa, which may rupture, permitting the ovum to escape, while the whole decidua remains in the uterus. In other instances, again, the fœtus alone escapes, and the whole ovum is retained—*incomplete abortion*. Sometimes a well-formed fœtus is found among the expelled masses, but in others it is only represented by a formless mass, even when the ovum is thrown off intact.

FIG. 246.



Abortive ovum expelled together with the whole decidua. (Olshausen-Veit.) *o.i.* corresponds to the internal os; *t* and *t'*, to the uterine orifices of the tubes.

Etiology.—Numerous are the agencies that may lead to abortion. In most cases the cause is to be found in the mother, but it may also exceptionally be of fetal origin. We distinguish between predisposing and exciting causes. Among the former endometritis often produces abortion. The inflamed endometrium does not form a favorable soil for the implantation of the ovum, which, instead of developing in the upper part of the uterus, either slides down and is grafted on the lower uterine segment or is washed out altogether. Or the hypertrophy of the connective tissue compresses the blood-vessels through which nourishment and oxygen are carried to the fœtus. Deep lacerations of the cervix deprive the ovum of some of the support it normally should find in that organ. Retroflexion of the uterus destroys the normal relations between the axis of the uterus and that of the vagina, and leaves the parturient canal in a direction much more favorable to the expulsion of the contents of the uterus than when it has its normal, somewhat anteflexed shape, forming an acute angle with the vagina. As a rule, the retroflexed uterus, increasing in size, rises out of the pelvis and becomes anteflexed. But sometimes it becomes impacted, and the condition ends in abortion. Anteflexion, although nearer to the normal relation between cervix and body, interferes with the normal development of the uterus during pregnancy, and may lead to early abortion. Myomas are accompanied by endometritis, and may, by their bulk, interfere with the free development of the ovum.

Among fetal conditions the vesicular mole ends frequently in abortion, and hypertrophy of the villi may press on the blood-vessels upon which the fœtus depends for its nourishment. That disease of the ovum entirely independent of the maternal organism may lead to abortion is seen in the cases of congenital syphilis in which the taint is inherited only from the father, the mother remaining healthy.

When some predisposing cause is present, even slight concussions, such as coughing, sneezing, vomiting, may become the exciting cause of abortion. That even without particular predisposition pregnancy may be interrupted by blows and kicks on the abdomen of the pregnant woman, and still more by penetrating wounds inflicted with sharp instruments or fire-arms, is evident. In this category must also be counted violent coition. Alcoholic abuse may become the cause of abortion by overexcitation of the circulatory system. Acute diseases accompanied by a high temperature are very apt to be accompanied by abortion, and among chronic diseases syphilis is the most common cause. Valvular heart disease may also become the starting-point of abortion, a stasis of blood being caused in the vessels connecting with the ovum.

When the fœtus dies, abortion must follow. All causes of fetal death enumerated in the preceding chapter, besides those which we have just spoken of, become, therefore, also indirectly causes of abortion.

Low temperature is said to cause abortion as well as overheating. Pulling on the nipples may cause uterine contraction and end in abortion. This manipulation, recommended for elongating defective nipples, must, therefore, be watched with care. Perhaps the normal congestion that takes place at each menstruation continues during pregnancy, although the menstrual flow is interrupted. Particular care should, therefore, be taken at these periods by women who are inclined to miscarry.

Prognosis.—The prognosis depends much on the treatment. In a general way it may be stated that most women are far from paying sufficient attention to a miscarriage, and that they often are severely punished for their foolhardiness and neglect. The two great dangers are hemorrhage and septicæmia, either of which, especially the latter, may end in death.

Treatment.[1]—Being called to a case of threatening abortion, the first question the practitioner should ask himself is, "Can abortion still be averted?" If the hemorrhage is considerable or has continued for days or weeks, if the cervical canal is open, and if the ovum is felt projecting into the vagina, abortion is inevitable, and then no time should be lost in temporizing. But if the loss of blood is moderate and the cervix closed, an attempt should be made to avoid the interruption of pregnancy. For this purpose the patient should be kept in bed. A suppository with a grain of pulvis opii should be inserted into the rectum every three hours, unless it cause dizziness or nausea, when the interval is made longer—say from four to six hours. If the bowels do not act freely, a saline aperient, especially a heaping teaspoonful of sodium sulphate dissolved in a tumblerful of water, should be administered by the mouth, and, if necessary, repeated every four hours. Finally, a teaspoonful of the fluid extract of viburnum prunifolium should be given three times a day, a drug which has a marked soothing influence on the uterus and counteracts contraction. Dr. Stephen Harrisberger, of Catlet, Virginia, praises acetanilid (gr. iv—25 centigrammes—every two hours while abortion threatens).

The diet should be cool and bland. Alcoholic drinks and coffee should be forbidden. Iced milk and fruit are appropriate, and should, in connection with bread, butter, and cold meat, constitute the menu. I have often combined the above treatment with the application of an ice-bag to the hypogastric region, but if the assertion that an extremely low temperature is as apt as a high one to produce abortion is well founded, it may be safer to omit it.

If abortion cannot be prevented, the question how to act presents itself. The old treatment, consisting in vaginal injections of ice-water, tamponade, and removal of the ovum when it lies loose in the vagina or is easily separated from the uterus with the finger, exposes the patient to great danger of hemorrhage or septicæmia. We have seen above that in very early pregnancy—during the first month and part of the second—the entire ovum may be expelled and hardly anything be left of the decidua. In such cases resort may be had to tamponade.

---

[1] Garrigues, "The Treatment of Abortion," Medical News, November 6, 1897.

This is especially indicated if the patient is in so weak a condition when seen that it is deemed wise to let her have time to recuperate before recourse is had to more active operative interference, or if she has to be removed to a hospital.

With these exceptions, the best treatment consists in curettage, previous to which the cervix must be dilated if it is not open. (See OPERATIONS.)

The intra-uterine use of steam—*atmokausis*, or *vaporization*—has been recommended in abortion cases. Being perfectly satisfied with my results, I have not felt like subjecting the patients to a procedure which I have tried for other purposes, especially hemorrhagic endometritis, and found to give rise to a protracted purulent discharge, and which in the hands of others has led to complete closure of the uterine canal, and even to death.[1]

By carrying out the treatment above described I have never lost a case, and there has not even been any kind of untoward complication. On the other hand, I have seen a number of cases in which I was first called when septicæmia had developed end in death. In these septic cases our resources are limited, and the prognosis should be very guarded. There may even be considerable doubt in regard to the best way of treating them. If the fœtus, ovum, or placenta is retained or if there is hemorrhage, the cervix must be dilated and the uterus curetted and irrigated. If, on the other hand, it is doubtful if anything remains in the uterus, it is often better to refrain from curetting, as by this operation the protective wall of leucocytes which nature has thrown out beyond the affected part may be destroyed, and pathogenic germs given a ready means of penetrating to the deeper, hitherto unaffected tissues.

The writer has even seen cases in which the mere introduction of an intra-uterine tube for washing out the uterus regularly caused a rise in temperature, and the patients recovered after all intra-uterine treatment had been discontinued.

In these septic cases a chief indication is to keep up the flagging strength by means of alcohol and strychnine. The patient should be given twelve ounces or more of whiskey or brandy during the twenty-four hours. Among wealthy patients champagne may be substituted. She should also have plenty of milk, eggs beaten up with milk, bouillon or chicken broth, beef juice, and strong beef tea.[2]

Quinine or salophen in five-grain doses every three or four hours seems sometimes to have a good effect.

Some have recommended the subcutaneous injection of anti-streptococcus serum, but this substance seems to have little effect.

---

[1] See Garrigues, A Text-book of the Diseases of Women, third ed., p. 187.

[2] See Garrigues, ibid., p. 240.

At best it does not seem to have any deleterious effect upon the patient.[1] Other remedies will be discussed under PUERPERAL INFECTION.

As a last resort the question of hysterectomy presents itself. What could be more rational than to remove the starting-point of the infection, even at the cost of lifelong sterility and considerable risk to life from the operation itself? But, unfortunately, when the condition is sufficiently serious to warrant so dangerous an interference, during which the patient may die on the table, the infection is of so virulent a nature and has progressed so far that no help is longer possible. To have recourse to this mutilation in mild cases of sepsis must be condemned, as the patients in all likelihood would recover under a more palliative treatment.

§ 2. **Habitual Abortion.**—Some women have so great a tendency to abortion that the event is repeated every time they get pregnant. The writer has seen a case in which nine abortions were finally followed by the birth of a child at term. The causes of this tendency are the same as some of those mentioned in speaking of the etiology of abortion, and these remaining unchanged the effect is also repeated. By far the most common is syphilis; but uncorrected uterine displacements, unrepaired tears of the cervix, chronic infection with the plasmodium of malaria, or exposure to the influence of carbon bisulphide may bring about a similar condition. If some such permanent cause is found, the first indication is to try to remove it. By instituting an antisyphilitic treatment of the husband, the wife, or both, we may sometimes succeed in eliminating the materia peccans, and thus helping our patient to get her hitherto frustrated desire of offspring fulfilled. It may be necessary for the patient to leave a malarious district, to change her occupation, or to undergo an operation for displacement of the uterus or a torn cervix.

Some have recommended absolute rest during pregnancy, but this is, in the writer's opinion, weakening, and may indirectly contribute to a miscarriage or leave the patient in a less favorable condition for the ordeal of childbirth. On the other hand, the author has repeatedly succeeded in preventing habitual abortion by ordering the patient to lie in bed or on a lounge during a week corresponding to the menstrual period. Rest should begin two days before menstruation would be due if pregnancy had not supervened, and be continued five days after that time. During this week I give a teaspoonful of the fluid extract of viburnum prunifolium, or, since the taste of this drug is very disagreeable to most patients, I have it inspissated and administered in gelatin capsules. During the remaining three weeks moderate exercise in the open air and the use of iron, quinine, red bone marrow, and arsenic are beneficial. Coition, dancing, horseback riding, bicycling, gymnastics, and all kinds of sports or fatiguing work must be absolutely forbidden. J. Y. Simpson recommended chlorate of potassium (gr. xv to xx—1 gramme to 1.30 gramme—t. i. d.), with a view of furnishing oxygen to the fœtus, which doubtless might be obtained in a much more effective way by inhalation of the gas, but others have thought they had good effects from the use of the drug independently of the theory.

---

[1] Report of Committee appointed by the American Gynæcological Society, Trans., 1899, vol. xxiv. p. 105.

§ 3. **Artificial Abortion.**[1]—Instead of trying to prevent or treating abortion when it threatens or has occurred, it sometimes becomes the duty of the conscientious physician to bring it about.

Indications.—Obstetricians differ in their views in regard to the circumstances that call for such a wilful interruption of the pregnant condition, and sometimes scientific considerations are overshadowed by religious doctrines. The Roman Catholic Church does not allow its adherents to kill a human fœtus under any circumstances, but from a scientific and humane stand-point the operation may be said to be indicated when on account of narrowness of the genital canal a viable child cannot be born, or when the mother's health is such that it would expose her to death or dangerous sickness to continue in the pregnant state.

The first indication, that based on mechanical obstruction, seldom occurs in this country, where the higher degrees of pelvic deformity are exceedingly rare. Before deciding on the performance of artificial abortion, the patient should be informed of her chances if she waits until the end of pregnancy and is delivered by symphyseotomy or Cæsarean section, by which the child's life may be spared.

The second indication, that based on disease in the mother, is much more common. Mere unwillingness to increase her family, general nervousness, the dread of supposed dangers of childbed, or the painful reminiscences from previous experience ought not for a moment to be considered by a conscientious practitioner. But as soon as well-ascertained facts in her past or the presence of demonstrable serious disease makes it likely that the patient would risk her life or seriously imperil her health by carrying her child to term, it is proper for the physician to recommend a speedy interruption of her pregnancy and for the obstetrician to perform the operation.

Apart from acute diseases, the character of which becomes more malignant on account of the pregnancy, conditions that justify recourse to artificial abortion are especially recent syphilis, advanced pulmonary tuberculosis, severe valvular heart disease, an aneurism of the aorta, carcinoma that has gone beyond the limits of radical treatment, chronic nephritis, serious affections of the nerve centres, and present or threatened insanity.

---

[1] Garrigues, "Artificial Abortion," Trans. Amer. Gynæcol. Soc., 1895, vol. xx. p. 469; Amer. Gynæcol. and Obstet. Jour., June, 1895.

In many of these conditions we should hesitate the less to destroy the fœtus if it is likely to inherit the mother's disease,—*e.g.* tuberculosis, cancer, or syphilis.

The mere presence of albuminuria is not a valid indication for artificial abortion. The writer has successfully treated numerous cases of this kind with chloride of iron, chloral hydrate, warm baths, and milk diet, even when decided premonitory symptoms of eclampsia, such as headache, cardialgia, vertigo, and dim vision, were present. Albuminuria should be looked upon as an indication for artificial abortion only when the condition is such as to imperil the patient's life.

The practitioner should also be very loath to admit vomiting as an indication for artificial abortion. By patience and remedial agencies the pregnancy can with few exceptions be made to continue to term.

Precautions.—No one, not even the most experienced obstetrician, should take the responsibility of performing artificial abortion guided by his own judgment alone. The case ought to be submitted to one or more other medical men, choosing if possible the consultants in such a way as to obtain the most reliable advice according to the nature of the condition or disease calling for interference,—an obstetrician in cases of obstruction in the genital canal, a neurologist in cases of insanity, a syphilologist in cases of syphilis, a man with wide medical experience in cases of diseases of the kidneys, lungs, or heart, etc.

The outcome of the consultation should be put in writing, signed by the consultant, and preserved by the obstetrician who is to perform the operation. I take also the precaution, if possible, to acquire the written consent of the patient and her husband. In case of untoward symptoms arising after the operation, or of a fatal issue, these documents would be of the very greatest value in protecting the operator from all the blame which the patient or her friends often lay at the door of the man who has been only actuated by the purest instincts of humanity and the most approved scientific doctrines. But there is little or no danger if the operation is properly performed. The troubles we read about in the newspapers occur only at the hands of professional abortionists or physicians who for lucre comply with the wishes of patients who do not want to have children.

The *treatment* is the same as that recommended above in cases of unavoidable abortion,—rapid dilatation, curetting, irrigation, and tamponade.

§ 4. **Criminal Abortion.**—Attempts to destroy the fetal life and cause abortion are made frequently with more or less success. Having exhausted the list of pills and medicines that have a reputation for accomplishing the return of menstruation without attaining their aim, recourse is had to surgical means. Many women have a very lax conscience in this respect and feel somewhat shielded by the old theory of quickening as the beginning of life, while for the physiologist and in the eyes of the law life begins from the moment the sexual elements have combined.

The women themselves poke knitting- or crochet-needles into their genitals, and if they often succeed in puncturing the ovum, they also sometimes perforate their uterus or the vaginal vault, causing serious hemorrhage or a septic inflammation of the pelvic organs that jeopardizes their lives. Or they are treated by doctors and midwives whose transparent advertisements are found in nearly all papers, especially those published in foreign languages. Although the laws concerning criminal abortion are very severe, these persons know how little likelihood there is of a complaint being made, and, be it ignorance or indifference, they expose their patients to the greatest dangers. They go so far as to introduce a sponge or laminaria tent and let the patient walk home from their office, or in their eagerness to destroy the fœtus with the uterine sound they make a wound in the uterus large enough to admit the thumb and allow the intestines to protrude into the vagina.

Respectable physicians when called to see patients upon whom other persons had performed abortion, and who were suffering from hemorrhage or pelvic inflammation, have sometimes been arrested by suspicious coroners and put under exorbitant bail. I deem it therefore good policy in all such cases to call a coroner's physician in consultation.

§ 5. **Premature Labor.**—Premature labor differs from abortion in so far as it occurs at a time when the child is viable, which, as we have seen above, is from the end of the sixth calendar month. The mother's organism approaches also the condition which is normal at the term of pregnancy and the more so the nearer she is the end of gestation. The active treatment recommended for abortion until the end of the fourth month would therefore not only be out of place, but positively unnatural and dangerous, especially curetting. In fact, in many cases the whole labor is very much like that at term and should be managed as such. If there is hemorrhage and no dilatation of the cervix, the vagina should be tamponed and the tampon renewed every six hours. But in the mean time the heart sounds of the fœtus and the mother's general condition should be watched carefully. If either mother or child shows signs of weakness, it is better to dilate the cervix with Hanks's large dilators and deliver the child. If the placenta is adherent, it is best to pack the uterus with iodoform gauze and the vagina with creoline cotton and wait for a day or two in the hope that its connection with the inside of the uterus may become loosened, but at the end of that time it must under all circumstances be removed in the way that will be described in speaking of retention of the placenta at term. If the premature labor is combined with placenta prævia—the insertion of the placenta over the internal os—the sooner the uterus can be emptied the better it is.

If the child is born much too early, it should receive all the care we have described above in treating of congenital weakness (page 254).

§ 6. **Induction of Premature Labor.**—Induction of premature labor differs from artificial abortion by being undertaken at a time when the child is viable and is often done in its interest. This operation is based on the observation that women who always got dead children at term occasionally gave birth to a living child if they happened to be taken in labor prematurely. But even when the child is dead, the operation may be indicated in the interest of the mother. Performed with proper antiseptic precautions, the operation is without danger for her and it may save her life or give her great comfort. In so far as the child is concerned, the chances for its survival increase with its age. Before the end of twenty-eight weeks' gestation these are so small that it would be senseless to operate in its interest, while, as we have seen, the mother's condition may be such that we even feel warranted in interrupting pregnancy before the child is viable, and, therefore, much more so when there is a possibility of saving it. But between the twenty-eighth and thirty-second week this happy event is so unlikely that, as a rule, the operation should not be undertaken. There may, however, be circumstances, especially in regard to inheritance, under which the parties concerned are much interested in having a living child, even if it should not live long.

Indications.—(1) Narrow pelvis; (2) diseases of the mother; (3) the habitual death of the fœtus; (4) mother dying; (5) dead child, if labor does not come on or mother is suffering.

Labor may be induced prematurely in moderate degrees of pelvic contraction both in the interest of the mother and in that of the child, the mechanical disproportion being less marked when the child has not reached its full development. The earlier the operation is performed, the more the passage of the child will be facilitated; but, on the other hand, the later we operate, the greater is the power of resistance of the child and consequently the chance of its not only being born alive, but of surviving. The most favorable time for performing the operation is at the end of the thirty-sixth week,—that is, four weeks before the normal end of pregnancy. Before the end of thirty-four weeks there is great danger of subsequently losing the child, even if it is born alive. But even after thirty-eight or forty weeks it may be advantageous to induce labor, in order to prevent further increase in size of the fœtus.

The degree of contraction which forms the limit for induction of premature labor depends on the size of the head which has to pass through the pelvis. The most common kind of contracted pelvis is the flat pelvis, in which the true conjugate is shortened. In this form of pelvis the head has to pass through the conjugate with one of its transverse diameters, the bitemporal or the biparietal or some intermediate line between the two. Now, measurements of a number of fetal heads have shown the following average dimensions (Ahlfeld):

Week of Pregnancy.	Biparietal Diameter. (centimetres)	Bitemporal Diameter. (centimetres)
32	7.85	6.5
33	8.2	7.1
34	8.0	7.25
35	8.2	
36	8.41	7.2
37	8.45	7.25
38	8.45	7.25
39	8.47	7.32
40	8.75	7.52

Schroeder found the biparietal diameter even somewhat longer: in the eighth lunar month 8.16 centimetres, in the ninth 8.69, and in the tenth 8.83.

Making allowance for some compressibility of the head, the lowest limit of contraction of the pelvis in which premature labor should be induced is therefore when the true diagonal measures seven centimetres, or 2¾ inches.

If the other dimensions of the pelvis are reduced, no general rule can be formulated, except that the conjugate then must be proportionately longer.

If the period of pregnancy is not known, we are reduced to a comparison between the size of the pelvis and that of the head. The true conjugate can be calculated pretty exactly, but direct measurements of the head through the abdominal and the uterine wall are far from accurate. The experienced obstetrician derives more information by grasping the head as described above (page 109), and forming an opinion about its size in relation to the pelvis, or he may try to press it down into the pelvis, or simply move the bent knees up and down and feel if the head engages in the brim of the pelvis; as long as it does so there is no need of hurry.

The birth of a living child in cases of contracted pelvis depends so much on the size of the head and the degree of ossification of its bones and the strength of uterine contractions that it is difficult to predict with certainty that a living child cannot go through a certain pelvis. The writer has repeatedly seen normal confinements at term in women in whom on account of a conjugate reduced to three inches he anticipated great trouble. As a rule, it is, therefore, better not to induce premature labor for pelvic deformity, unless experience in one or more preceding labors has shown that the patient cannot give birth to a living child at term. Exact information about the measurements and condition of the fetal head in previous confinements is of the greatest value in this respect.

Before determining to induce premature labor, the accoucheur should use every means of satisfying himself by palpation and auscultation that he has not to deal with twins simulating a large child. If the mother is so seriously ill that her life is endangered, and there is reason to believe that her condition will be much improved by the termination of her pregnancy, the induction of premature labor is justifiable, even with some risk to the child. Dyspnœa and suffocating spells occurring in consequence of pneumonia, pulmonary tuberculosis, heart disease, nephritis, or hydramnion are the chief conditions that call for the premature interruption of pregnancy. If the child is dead, the indication for bringing relief to the mother is, of course, still more urgent.

It has been noticed that in some women the child habitually dies about the same time of pregnancy, and that its life may be saved by induction of premature labor. In such cases the operation should be performed shortly before the term at which death occurred in previous pregnancies.

If the mother is in a dying condition and the child living, it is our duty either to be prepared to perform Cæsarean section immediately after her death or, if possible, to induce premature labor before she dies. The cutting up of the body of a beloved person the moment she expires has something so harrowing to the feelings that in many cases the second alternative will be preferred, even in spite of the unavoidable addition to the sufferings of the dying woman and with the risk of hastening her death.

We have already mentioned that labor should be induced if the child is dead and the mother in a condition which presumably will be improved by the interruption of pregnancy. If the mother is in good condition, but labor does not come on within a reasonable time, it is better to induce it. If the child is alive, we thereby avoid its further growth, which might jeopardize the lives of both mother and child, and if the child is dead, we prevent its undue retention in the maternal body.

§ 7. **Hunger Cure.**—In order to avoid induction of premature labor in cases of moderate coarctation of the pelvis, it has been recommended to put the mother during the last two months on a special and somewhat restricted diet. The writer has tried this only once, in a case where the conjugate measured three inches, and the result was perfect; but the same lady later gave birth to a full-grown child without keeping to this diet. There have come many favorable reports from other observers; but complete failures have also occurred, and we see poor women who have no abundance of food occasionally give birth to very large children. The diet is particularly aimed against the production of fat, but the difficulties in mechanical disproportion arise much more from the bones than from the fat of the child. The diet recommended consists in the following: For breakfast, four ounces of black coffee or tea and one ounce of zwieback or toast; for lunch and dinner, a sufficient amount of beef, mutton, veal, pork, game, poultry, eggs, fish, lobsters, crabs, shrimps, crawfish, oysters, clams, scallops, mussels, green vegetables, lettuce salad, cheese, a small amount of juicy fruit, two ounces of bread, with half a pint of claret or Moselle wine. Butter and other fats are harmless. Forbidden, on the other hand, are soup, water, milk, beer, potatoes, beets, cereals, puddings, pies, and other sweet dishes, candy, as well as bananas.

CHAPTER IV.

MISSED LABOR.

MISSED LABOR is the name given to an exceedingly rare event. At the time labor was due, either it does not begin at all or it is ineffectual and soon ceases, the fœtus remaining in the uterus, where it may stay for many months or even years. As a rule, the waters break and drain off, and microbes enter the uterine cavity, causing putrefaction of the fœtus, which becomes disintegrated, and is eliminated piecemeal either through the os or through openings forming in the uterine and abdominal walls. Communication with the intestine has also been observed. As a rule, the patient is carried off by exhaustion and septicæmia.

Etiology.—The cause of missed labor used to be shrouded in impenetrable mystery. Later observers have repeatedly found extensive peritonitis, but the question remains whether this is the cause or the effect of the missed labor. If it is the cause, perhaps adhesions prevent uterine contraction or the musculature of the uterus may undergo fatty degeneration. In one case the uterine wall was full of myomas that had undergone fatty degeneration.

Treatment.—In view of the extremely serious prognosis, every effort should be made to dilate the cervix, remove the fœtus, and wash out the cavity of the uterus with antiseptic fluid. When fistulous tracts have formed through the abdominal wall, it may be possible to dilate them with laminaria tents or incise their surroundings sufficiently to give exit to parts of the fœtus.

CHAPTER V.

MISSED ABORTION.

Missed abortion forms a companion-piece to missed labor, but while the latter is one of the rarest occurrences in obstetrics, the former is quite common. As missed abortion we designate namely the condition in which early in pregnancy the fœtus dies and is retained in the uterus, which it may be for many months. The liquor amnii is absorbed, and the fœtus dries up and becomes mummified.

Treatment.—In the beginning an expectant treatment is indicated, for, as a rule, abortion will follow within a few weeks. But if there is bleeding or any other undesirable symptom, the uterus should be emptied, as described in the chapter on abortion and premature labor.

CHAPTER VI.

DISEASES OF THE GENITAL ORGANS.

§ 1. **Malformations.**—Embryology teaches us that the uterus and the vagina, as well as the Fallopian tubes, are developed from the Müllerian ducts, two tiny canals that extend from the abdominal cavity to the vulva. That part of the Müllerian ducts that lies above the round ligament of the uterus remains separate from that of the other side, and forms the Fallopian tube, while that part which is situated below the round ligament, together with the lower ends of another pair of tubes, the Wolffian ducts, which extend from the Wolffian body, the primitive kidney, to the vulva, forms a quadrangular cord with rounded edges, the *genital cord* (Fig. 247).

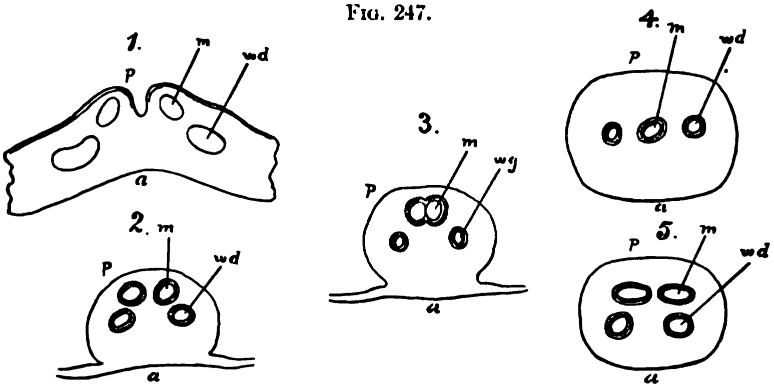
The tissue that separates the two Müllerian ducts is gradually absorbed, until at the end of the second month there is one canal instead of two. The genital cord is developed so as to form the uterus above and the vagina below. While the fusion of the Müllerian ducts is still incomplete, they are separated above, forming the two ***horns*** of the uterus (Fig. 248).

About the middle of pregnancy the fetal uterus forms one sac without horns.

The Müllerian ducts open into the lower part of the urachus,—

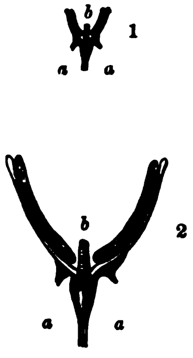
that is, that part of the allantois which is included in the fetal body, and later forms the bladder. This lower part, situate below the openings of the Müllerian and the Wolffian ducts, is called the *urogenital sinus*. Originally this sinus opens into the cloaca. Later a septum is formed, dividing the cloaca and thereby separating the urogenital sinus from the rectum. The urogenital sinus growing much less than the other parts, especially the vagina, in course of time it appears as the continuation of the latter and becomes the vestibule.

FIG. 247.



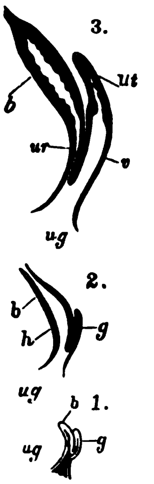
Transverse sections of the genital cord of the embryo of a cow, two and a half inches long. Enlarged fourteen times. (Kölliker.) 1, from the upper end of the cord; 2, somewhat lower down; 3, 4, from the middle of the cord, showing incomplete and complete fusion of the two Müllerian ducts; 5, from the lower end, showing the Müllerian ducts separated. *a*, anterior surface of genital cord; *p*, posterior surface; *m*, Müller's duct; *wd*, Wolffian duct.

FIG. 248.



Ovaries, tubes, and uterus of human fœtus from the tenth week, twenty-six millimetres long. (H. Meyer.) 1, natural size; 2, enlarged four times. *a*, round ligament; *b*, rectum.

FIG. 249.

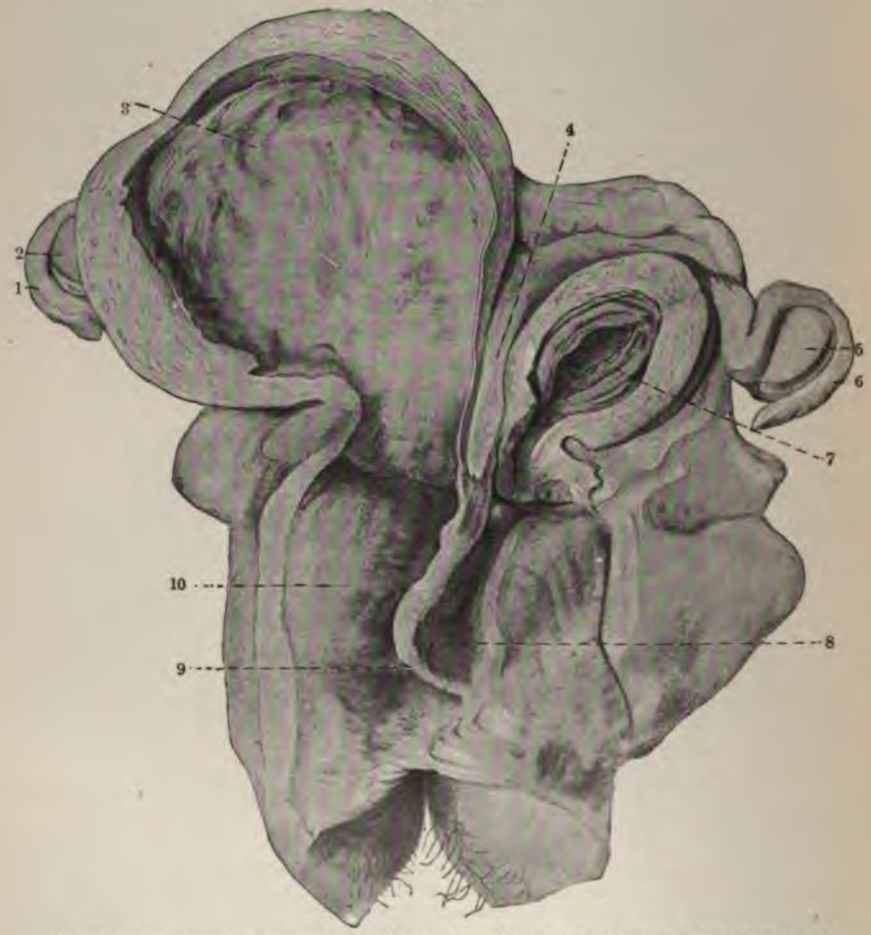


Urogenital sinus and its appendages from human embryo. Life size. (Koelliker.) 1, from a three months' fœtus; 2, from a four months' fœtus; 3, from a six months' fœtus. *b*, bladder; *ur*, urethra; *ug*, urogenital sinus; *g*, genital canal (common rudiment of vagina and uterus); *v*, vagina; *ut*, uterus.

In the fifth and sixth month of fetal life the vagina is separated from the uterus by the formation of a ring (Fig. 249).

Bearing in mind this origin of the uterus and the vagina, we can easily understand the different malformations of these organs, which all can be reduced to an arrest of development, whereby the growth or the fusion of the Müllerian ducts becomes defective. Those forms of malformations which prevent conception, such as atresia of the genital canal, do not concern us here; but there are others that are of more or less importance to the obstetrician.

Fig. 250.



Uterus duplex separatus, or uterus didelphys. (Nagel.) 1, right tube; 2, right ovary; 3, right uterus, in which the fœtus was developed; 4, rectovesical ligament; 5, left ovary; 6, left tube; 7, left uterus with decidua; 8, left vagina; 9, vaginal septum; 10, right vagina.

1. Uterus Duplex Separatus, or Uterus Didelphys.—This variety of uterus is produced when the two Müllerian ducts do not even come

in contact with each other in that part of their course in which they usually blend, forming the uterus. The consequence is that there are two entirely separate uteri, but each of them represents only one-half of the total organ. Each half has at its upper end a Fallopian tube and a round ligament. At the lower end the double cervix opens into a single or double vagina, or this organ may be more or less defective (Fig. 250).

In the living woman it will hardly be possible to distinguish the uterus didelphys from the two-horned uterus through the closed abdominal wall, but the writer once found such a case in performing salpingo-oöphorectomy.

The prognosis is, as a rule, good, since pregnancy and labor may take an entirely normal course; but sometimes the second uterus, which usually becomes retroflexed, has offered an obstacle to the birth of the child. On account of the intimate connection between the two parts of the uterus, a decidua forms, and the musculature becomes hyperplastic in the empty half as well as in that occupied by the fœtus, and in twin pregnancies each compartment of the uterus may contain a fœtus.

2. Uterus Unicornis.—If only one of the Müllerian ducts is developed while the other is absent or rudimentary, the result is a one-horned uterus (Figs. 251, 252).

The one-horned uterus is always very long, forms a curve with the concavity turned outward, and ends in a point without a fundus.

Pregnancy in a plain unicorn uterus may not offer any peculiarity, and women with such uteri have borne many children without any difficulty. The diagnosis is easier in the unimpregnated condition than during pregnancy, the peculiar position and shape being recognizable in the former by bimanual and rectal examination, while, when the uterus develops during pregnancy, it may be much like a normal uterus.

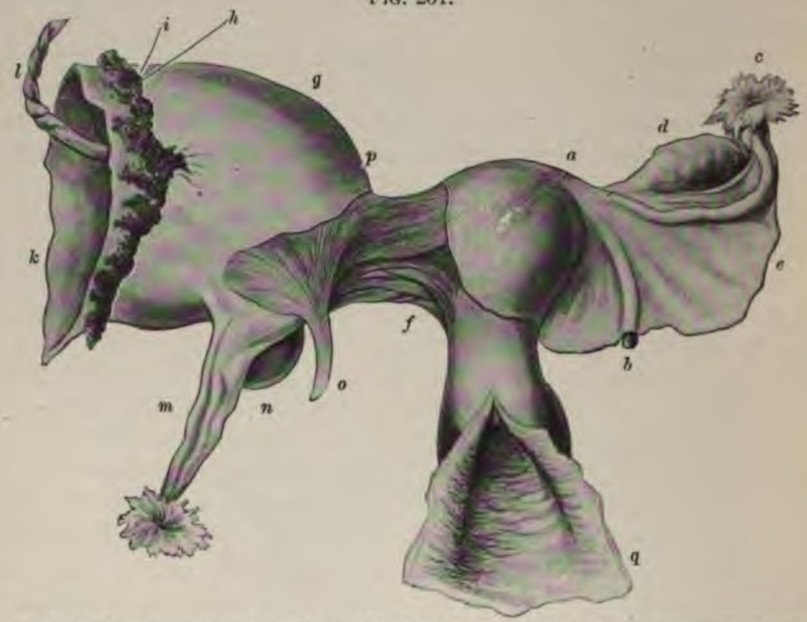
But attached to the point where the cervix merges into the body of the unicorn uterus is sometimes found a *rudimentary horn*. If pregnancy takes place in this, the condition is a very grave one, the rudimentary horn being incapable of producing the necessary muscular tissue to form a sac for the growing fœtus. The situation is then practically the same as in tubal pregnancy, from which it cannot be distinguished clinically.

As a rule, pregnancy ends in rupture of the unprotected fetal sac, which rupture usually occurs between the third and sixth months of gestation, and is fatal. In rare cases, however, the pregnancy continues until term, when the child dies and by calcareous deposit is changed into a stony mass called *lithopædion*, which may be carried for many years or undergo suppuration and disintegration and kill its bearer through septicæmia.

Even anatomically the examiner may be led into error, as was the case with regard to the specimen we reproduce in Figs. 263 and 264. The landmark is the insertion of the round ligament. A tube, be it ever so narrow, if situated inside of the round ligament, is a horn of the uterus, while the Fallopian tube starts from the same point as the round ligament and extends outward.

An ovum may develop in a rudimentary horn that has no communication with the other horn or the vagina. This may be brought about in one of two ways,—either the fertilized ovum from the ovary corresponding to the pervious horn is by external migration (p. 12) carried over to the fimbriæ of the other tube and migrates through this to the cavity of the closed horn, or the spermatozoids may in a similar way wander through the well-developed horn, the corresponding tube, the abdominal cavity, and the tube of the other side, which process is called the *external migration of the semen*. In this latter case the ovum originates in the ovary corresponding to the rudimentary horn.

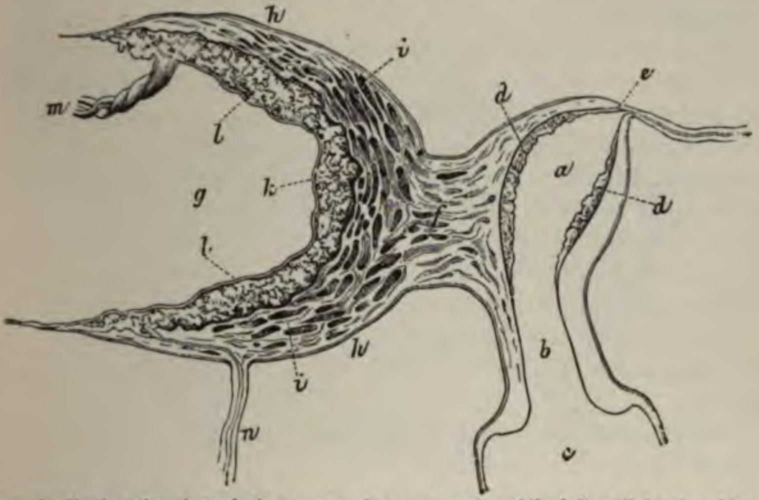
FIG. 251.



Left-sided uterus unicornis with gravidity in right rudimentary horn; rupture in the sixth month. (Observed by Tiedemann and Czihac, revised by Kussmaul, Mangel, Verkümmerung und Verdopplung der Gebärmutter, Würzburg, 1859, p. 141.) *a*, one-horned uterus, mostly covered with peritoneum; *b*, left round ligament; *c*, left tube; *d*, left ovary; *e*, left broad ligament; *f*, muscular band connecting the left horn with the sac containing the fœtus; *g*, fetal sac; *h*, rupture of fetal sac; *i*, placenta; *k*, membranes of ovum; *l*, umbilical cord; *m*, right Fallopian tube; *n*, right ovary; *o*, right round ligament, radiating into fetal sac and spreading over muscular connecting band into left horn; *p*, limit of peritoneal cover of fetal sac; *q*, vagina.

Treatment.—The treatment is the same as for tubal pregnancy, from which it cannot be distinguished. During the first three or four months an attempt may be made to kill the fœtus with a strong galvanic current. But in our days, when there is so strong a tendency to operative interference, most obstetricians will be in favor of removal of the offending horn by means of laparotomy—*semi-amputation of the gravid uterus.* If pregnancy continues beyond the fourth month, there is hardly any other way than the latter, which also is indicated after rupture or after the death of the child; but while the prognosis for the operation is good before rupture, it is nearly desperate after rupture or the development of septicæmia. In the latter eventuality it would probably be better to perform supravaginal amputation with

FIG. 252.



Longitudinal section through the same specimen. *a*, cavity of the left, well-developed horn; *b*, cervical canal; *c*, vagina; *d d*, decidua; *e*, top of left horn, continuous with the Fallopian tube; *f*, muscular connecting band; *g*, cavity of a rudimentary right horn transformed into fetal sac; *h h*, peritoneum; *i i*, muscular tissue with innumerable cut blood-vessels; *k*, placenta; *l l*, membranes of ovum; *m*, umbilical cord; *n*, right Fallopian tube.

external treatment of the stump according to Porro, which will be described under Cæsarean Section.

3. UTERUS BICORNIS.—When the Müllerian ducts remain more or less separated from each other in that part of their course which forms the uterus, this organ appears with two more or less distinct horns at its upper end. There may be a complete partition going all the way down to the external os, so that there is a double cervix; or the cervix may be single; or the partition may be absorbed more or less high up between the two horns, until it is represented inside only by a ridge at the fundus, while on the outside the horns are separated only by a corresponding slight depression (*uterus arcuatus*).

Diagnosis.—The presence of a double vagina makes it likely, but not sure, that the uterus is also double. If the cervix is also double, the likelihood of the uterus being partitioned becomes still greater, and if only one side is impregnated, this is tilted to the corresponding side of the abdomen. If both sides contain a fœtus, there is felt a deep furrow extending from the fundus to the symphysis. In cases of uterus arcuatus the peculiar shape, especially during uterine contraction, may be felt.

Prognosis.—The prognosis is good if the communication is free from the uterine cavity to the external genitals; but if the impregnated horn is closed, we have a condition similar to that just mentioned in connection with the one-horned uterus with a rudimentary second horn. The prognosis is also much less good if the pregnancy in one horn is complicated with a retention of menstrual blood in the other —hæmatometra.

Treatment.—In most cases only the ordinary management of normal labor is called for. In a case of pregnancy in a closed horn laparotomy and amputation of this horn are indicated. In complication with hæmatometra and hæmatocolpos, it may become necessary to make an incision in the partition and wash out the accumulated fluid in order to give room for the passage of the child.

4. UTERUS SEPTUS, OR UTERUS BILOCULARIS, is a uterus with a normal outer shape but with a complete partition between the two halves, which is much rarer than the corresponding bicornute variety.

If the septum is incomplete, the uterus is called *subseptus*. Pregnancy may occur in either or both halves, and childbirth take its normal course.

The presence of a double uterus has probably given rise to many cases of supposed superfetation.

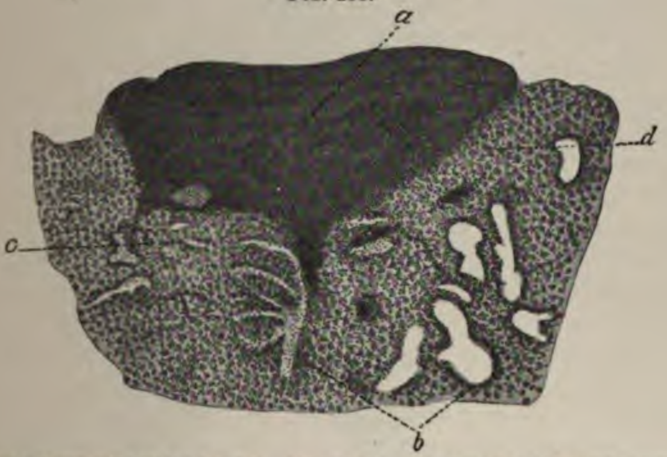
§ 2. **Inflammations.**—DECIDUAL ENDOMETRITIS.—Endometritis may have existed before pregnancy began or developed during it. The inflamed condition of the lining membrane of the womb constitutes, however, a hinderance to conception, the tissue being less fit for the nidation of the ovum, or perhaps the spermatozoids become deteriorated. If pregnancy occurs, the ovum is apt to slide too far down before it is embedded, which may give rise to placenta prævia, or the pregnancy may terminate in abortion. The inflamed decidua may also form too close a connection with the chorion, so that the placenta remains adherent when after the birth of the child it should separate from the uterus.

During pregnancy endometritis may develop in consequence of maternal syphilis, gonorrhœa, febrile infectious diseases, or Asiatic cholera. The inflammation may begin simultaneously with conception,—for instance, when a woman becomes infected from a syphilitic man at the time of impregnation. The endometritis may also be acquired during labor by infection from the cervix, and is then characterized by a purulent discharge from the inside of the womb.

The presence of acute endometritis is proved by the production in the decidua of areas composed of or infiltrated with small round cells (Fig. 253). A chronic form gives rise to the formation of tubercles or polypi on the surface of the decidua—*endometritis tuberosa* and *polyposa* (Fig. 254).

The reflexa does not coalesce with the vera and the cervical plug is not formed or it is washed away. Often considerable amounts of a watery fluid are secreted (*hydrorrhœa gravidarum*), which either dribbles away or accumulates until all is ejected at once, which often is followed by abortion. The fluid is watery, yellowish, sometimes tinged with blood. It is easy to distinguish it from liquor amnii. It contains uterine cells, while the liquor amnii contains lanugo and large cells filled with fat. Sometimes there is a discharge of sanguinolent mucus, pure blood (*hemorrhagic endometritis*), or pus.

FIG. 253.



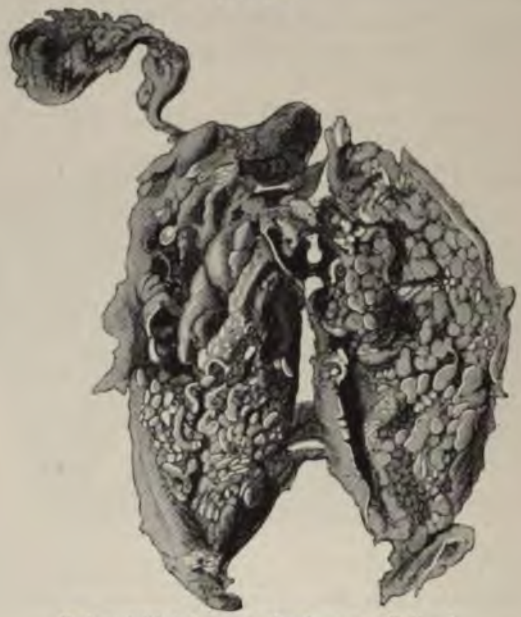
Interstitial inflammation of the decidua. (Emanuel.) *a*, wedge-shaped infiltration with small round cells; *b*, enlarged glands; *c*, small blood-vessels; *d*, glands.

Sometimes cysts form in the decidua (*cystic endometritis*). In syphilitic women true gummata have been found in the decidua. In the placenta we often find fibrous connective tissue, forming large white patches. The decidua may become much hypertrophied, so as to form a thick layer on the ovum, or be retained in the uterus after its expulsion, forming a sac that subsequently may be expelled spontaneously or necessitate artificial removal with the hand or the curette.

Frequently women complain of pain in the uterus during pregnancy, which probably most of the time is due to endometritis.

Treatment.—We cannot do much during pregnancy. Opiates should be used with great discretion, in order not to create a habit. When there is loss of blood, the patient should be kept quietly in bed and have the treatment recommended for preventable abortion,—opium suppositories, fluid extract of viburnum prunifolium, a saline aperient, and cool, bland diet. During acute inflammation it may become necessary to apply an ice-bag and give antipyretics. But if our resources are limited during the duration of pregnancy, we should treat the patient according to the rules of gynæcology when involution is terminated and before a new impregnation occurs.[1]

FIG. 254.



Endometritis tuberosa and polyposa. (Bulius.)

METRITIS.—The inflammation of the parenchyma of the uterus occurs rarely during pregnancy, and can hardly be clinically distinguished from endometritis. The treatment is the same.

PERIMETRITIS.—The inflammation of the peritoneal covering during pregnancy is still rarer than metritis. The treatment is the same, only opium must be used in much larger doses and combined with quinine. Towards the end of pregnancy the induction of premature labor is indicated.

COLPITIS, VAGINITIS, OR ELYTRITIS.—As we have seen above, there are considerable venous congestion, œdema, and formation of new tissue in the vagina during pregnancy, and some degree of leucorrhœa is so common during this condition that it is counted among the signs of pregnancy. No wonder, therefore, that inflammation of the mucous membrane of the vagina is of frequent occurrence. The inflammation may be *simple catarrhal*, *granular*, *gonorrhœic*, or *emphysematous*. In the simple catarrhal there are thickening of the epithelium, enlargement of the papillæ, and formation of heaps of small round cells under the papillæ. In the granular form a similar process takes place on a greater scale, forming prominences on the surface varying in size from a millet-seed to a lentil. In the gonorrhœic form the gonococcus may be found in the secretion and in the interior of the epithelial cells, or even in the mucous membrane and submucous tissue.

---

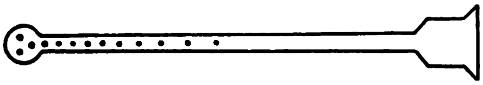
[1] See Garrigues, Text-book of Diseases of Women, third ed., pp. 432–435.

Symptoms.—The patients complain of a disagreeable sensation of heat in the vulva and the vagina. They have pains in the pelvis and the groins, which increase by walking or other exercise. They have a sensation of general malaise, and the pulse and temperature may show that they have fever. Micturition is accompanied by a scalding sensation. Defecation may also be painful. The vagina becomes so sensitive to touch that coitus becomes impossible and the introduction of a speculum unbearable. The mucous membrane is red and swollen, sometimes covered with prominences that make it feel like a grater. At first it is dry, but soon it is covered with a more or less abundant discharge, which in the beginning is mucous, then mucopurulent, and still later sometimes becomes a thick creamy pus, which may be mixed with blood. In other cases it is more white and foaming. Sometimes semi-solid cheesy masses are seen protruding from dilated glandular openings. By pressing on the urethra often a drop of pus can be brought to view. The inflammation may spread to the vulvovaginal gland and cause the formation of an abscess in this organ.

Prognosis.—The simple and granular colpitis are not of much importance and are easily cured. Not so the gonorrhœal form, which may give rise to dangerous inflammation in the mother during the puerperium, and exposes the child to ophthalmia and blindness. It is also more obstinate in its resistance to treatment.

Treatment.—In mild, non-specific cases injections of a pint of a solution of alum or borax (a teaspoonful to a pint of lukewarm water) twice a day may suffice. If the patient is feverish and the genitals are very tender, she should stay in bed, use injections and affusions of plain lukewarm water or flaxseed tea, have a saline aperient, and be put on a bland and scant diet. When the sensitiveness is somewhat subdued and the discharge is purulent, injections containing creolin, lysol, or carbolic acid (from ½ to 1 per cent.) should be used. If the disease resists this milder treatment, the author has seen prompt effect from the application of undiluted tincture of iodine to the whole surface of the vagina two or three times a week. A 2 per cent. solution of nitrate of silver or a 10 per cent. solution of copper sulphate may be poured into a tubuliform speculum introduced into the vagina and moved to and fro. If the urethra is affected, it should be touched with a match or toothpick wound with absorbent cotton and dipped in a solution of nitrate of silver (5 per cent.), or a few drops of the same may be injected with Fritsch's syringe (Fig. 255), a hypodermic syringe to which is attached a tube with a small bulb at the end and perforated with several fine holes.

Fig. 255.



Fritsch's urethral syringe.

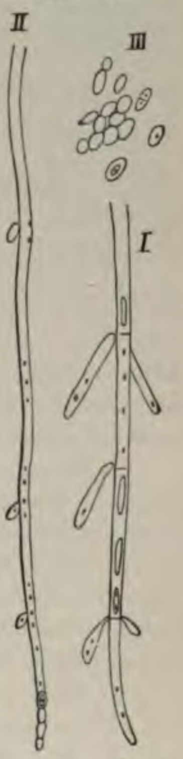
During pregnancy it is not safe to inject large amounts—quarts or gallons—of fluid. Bichloride of mercury, which is so efficacious in gonorrhœal colpitis in the unimpregnated condition, is so dangerous in pregnancy that it should not be used. On the other hand, there does not seem to be any danger in the use of medicated pledgets in the vagina, so that those who prefer the tampon treatment to injections in gonorrhœa may safely employ it.

Emphysematous colpitis was first described under the name of *colpohyperplasia cystica*. This disease is particularly connected with pregnancy, and is rarely found outside of it. It is not very common. It is characterized by the presence in the upper part of the vagina and on the vaginal portion of the uterus of numerous translucent pink, gray, or bluish, soft cysts varying in size from a millet-seed to a hazelnut. They are situated superficially, either in dilated lymph-vessels or in the surrounding connective tissue, and accordingly they are lined with endothelium or they have no such lining. They contain a serous fluid and often gas. Some have a central depression. Sometimes they give a crackling sensation like an emphysema. When the cysts are pricked, the gas escapes with a distinct wheezing sound, and the cysts collapse. The disease is always accompanied by a profuse vaginal discharge, and the vagina is tender to touch. Otherwise the condition does not give rise to any symptoms, and it disappears, as a rule, within two weeks after confinement. The gas is produced by *bacillus emphysematosus*, which can be isolated and cultivated. No treatment is needed, except cleansing injections as in other forms of colpitis.

Mycotic Colpitis.—Two kinds of fungi are often found in the vagina of pregnant women,—*leptothrix vaginalis* and *oïdium albicans*. Leptothrix consists of fine undivided threads with oval spores. Oïdium (Fig. 256) has hair-like branches. It is the same fungus as the one forming the thrush in the mouth of the new-born.

Leptothrix hardly gives rise to any symptoms. Oïdium causes sometimes intense pruritus, burning, swelling, catarrhal discharge, and even fever. The disease may end in a few days, or continue for weeks or months. The mucous membrane of the vagina is red, tender, and studded with little white spots, which can only be removed together with the epithelium, and under the microscope prove to be composed of hyphæ and spores.

FIG. 256.



Oïdium albicans. (Haussmann.) I, II, thread-shaped form; III, yeast-shaped form.

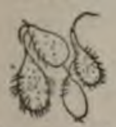
The fungi may be brought directly into the vagina by coition with men affected with diabetes mellitus, a disease in which they frequently are found between the prepuce and the glans. They may also be carried in by fingers which have handled flour, such as those of millers and bakers. The disease can, as a rule, easily be cured.

Besides the injections mentioned above, those with sulphate of copper, permanganate of potassium (1 or 2 per cent.), salicylic acid (1 or 2 per thousand) are recommended in this particular form of colpitis.

Another organism often found in the vaginal secretion of pregnant women is the *trichomonas vaginalis*, an infusorium that is somewhat like a mucus-corpuscle, but has a long tail, and is covered with cilia (Fig. 257). It is without clinical importance.

ÆDŒITIS.—The inflammation of the vulva is mostly combined with that of the vagina, and is quite common. The mucous membrane is red, swollen, and covered with mucopurulent secretion. There is a sensation of heat and pain, especially scalding during micturition. The groins may become the seat of intertrigo, and the upper part of the inner surface of the thighs may become eczematous. Intolerable itching harrows the patient, prevents sleep, and may drive her to masturbation.

FIG. 257.



Trichomonas vaginalis. (Haussmann.)

Gonorrhœal ædœitis is much like simple catarrhal, but redness and swelling are more intense, the discharge is more purulent, the inflammation has a tendency to implicate the urethra, and bacteriological examination may show the presence of the gonococcus of Neisser.

In regard to prognosis, the reader is referred to what has been said under colpitis, and the treatment is also much the same, with some additions. Lukewarm sitz-baths may be used to advantage two or three times a day. For the intertrigo a mixture of zinc oxide with three parts of corn-starch is the best, and for the eczema either the unguentum diachylon of the pharmacopœia, or, preferably, the following modification:

℞ Plumbi oxidi, 1 part;
Ol. olivæ, 3 parts;
Aquæ, 4 parts;

which ingredients are boiled over a slow fire to the consistency of thick cream of salmon color. It is rubbed into the skin morning and evening.

§ 3. **Pruritus vulvæ** is frequent in pregnant women. It is characterized by an itching sensation on the inner or outer surface of the vulva, sometimes extending into the vagina or over the lower half of the abdomen. It may be due to ædœitis, but is also found independently of inflammation. Sometimes the cause is direct irritation by parasites,—lice or itch-mites,—acrid discharge from the vagina, or urine containing sugar, for which proper tests should be used, especially boiling with Fehling's solution, the copper in which is precipitated by sugar.

Treatment.—First of all we should try to find a special cause apart from the pregnant condition, and then, if possible, remove it. If there are crab-lice among the hairs of the mons Veneris, these should be cut or shaved off, and the skin smeared with blue ointment or painted with balsam of Peru, or washed with a strong solution of corrosive sublimate (1 grain to alcohol and water, āā ℥ss). If the *acarus scabiei* is the offender, which, fortunately, is rare in this country, we should try to exterminate it with beta-naphtol in vaseline (gr. xxv to ℥i), or sulphur ointment; but sometimes a general treatment for itch of the whole body may be needed. Since this is rather harsh, it is, however, better to postpone it until after the puerperium.

Inflammation of the vulva and vagina should be treated as described above. Pin-worms are removed from the rectum by extractum sennæ et spigeliæ fluidum (℥ss t. i. d. by the mouth) or rectal injections of an infusion of quassia (℥ii to Oj). Hemorrhoids should be kept in check with unguentum gallæ or similar substances. Glycosuria should be treated according to the rules of practice of medicine, remembering, however, that strychnine, being liable to cause abortion, is contraindicated in pregnancy.

The diet is of great importance. Besides following the special rules for diabetes or gout, alcoholic drinks, strong coffee, and spiced food should be avoided. The food should be nourishing, but bland. Milk in large quantities—two or three quarts a day—is to be recommended, if it can be digested. If it causes dyspepsia in its natural state, it should be tried boiled, skimmed, or peptonized.

The general treatment should be tonic, sedative, and narcotic.

Arsenic and quinine are particularly recommended. Bromide of potassium in large doses (ʒi–ʒii—from 4 to 8 grammes—daily) is often very valuable. Tinctura cannabis Indicæ (gtt. xx to xl—from 120 to 250 centigrammes—t. i. d.) is preferable to opium for combating pain. It may be necessary to procure sleep by means of chloralamid sulphonal, urethane, trional, or other modern hypnotics.

The local treatment is not less important. On account of the pregnancy, only small amounts of injection fluid should be used. The routine treatment of the writer is to prescribe vaginal injections of carbolic acid (a teaspoonful to a pint), to paint the whole mucous membrane of the vulva two or three times a week with a solution of nitrate of silver (from 5 to 8 per cent.), and let the patient keep the labia separated by means of fine rags—for instance, pieces of an old pocket handkerchief—dipped in the following mixture:

℞ Acidi hydrocyan. dil., ʒii (8 grammes);
Plumbi acetat., ℈ii (260 centigrammes);
Glycerini, q. s. ad ℥ii (60 grammes);

and changed five or six times a day. Other combinations that may be useful are—

℞ Chlorali hydrat., ʒi–ii (4–8 grammes);
Vaselini albi, ℥ii (60 grammes).

℞ Chlorali hydrat.,
Camphoræ, āā ʒi (4 grammes);
Vaselini albi, ℥ii (60 grammes).

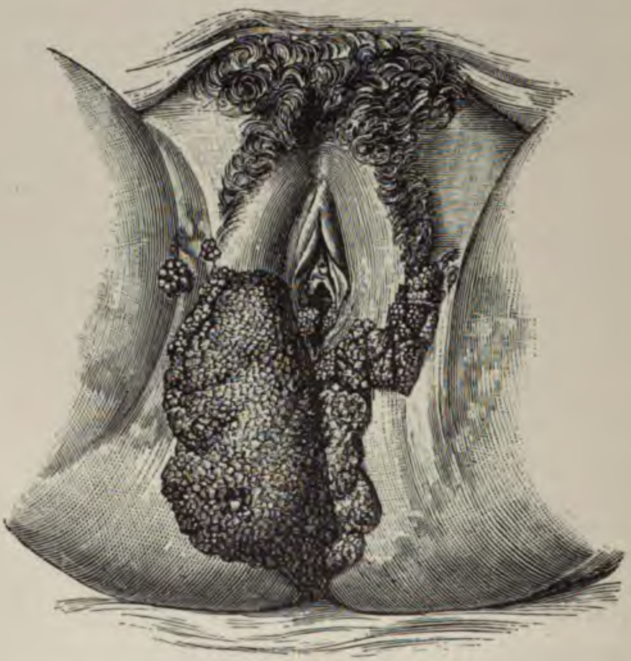
℞ Chlorali hydrat.,
Camphoræ, āā ʒii (8 grammes);
Acidi oleici, q. s. ad ℥ii (60 grammes).

℞ Chloroformi, ʒii (8 grammes);
Vaselini albi, ℥ii (60 grammes).

A tampon soaked in equal parts of sulphurous acid and glyceratum boracis may be introduced several times a day into the vagina.

§ 4. **Tumors.**—VEGETATIONS, VENEREAL WARTS, OR CONDYLOMATA ACUMINATA are a kind of papillomas, which are frequently observed during pregnancy. They are especially common in patients affected with gonorrhœa, but may also appear in patients who have no other affection of the genitals, and are then due to lack of cleanliness. Their most common seat is on the fourchette, at the vaginal entrance, and on the labia minora and majora; but they may extend through the whole vagina and to the vaginal surface of the vaginal portion of the uterus, the inside of the thighs, and around the anus. On the mucous membrane they are soft; on the skin they are harder. They begin as small erosions, which soon change to pin-head sized granular papules. After that they grow rapidly, forming sessile or pedunculated, club- or coxcomb-shaped protuberances. Their color varies much: some are light gray, others are pink, dark red, or purplish. They vary in size from a hemp-seed to a raspberry; but if neglected, the different isolated growths come in contact with one another, and may form a tumor as large as the fetal head (Fig. 258). Their surface shows always protuberances separated into smaller cauliflower-like parts springing from a narrow base. They exhale a mucoid secretion of a sickening odor. Even the dry vegetations on the skin are apt to become eroded and secrete such fluid. The acrid secretion may cause colpitis and ædœitis, and the tumors may mechanically obstruct the meatus urinarius, the entrance to the vagina, and the anus, so as to interfere with micturition, coition, defecation, and childbirth. When they are destroyed, new ones are very prone to spring up. The secretion, if carried into the eyes, is apt to cause purulent ophthalmia. During childbirth there is the same danger of infection for the eyes of the child and of puerperal infection for the mother.

FIG. 258.



Vulvar vegetations. (Tarnier and Budin, l. c.)

Diagnosis.—Flat and broad vegetations may simulate mucous patches; but with these we have a history of syphilitic infection, and, as a rule, other concomitant symptoms of syphilis. Mucous patches are few in number and develop more slowly.

Treatment.—When small in size, vegetations may be destroyed with liquor antimonii chloridi, corrosive sublimate collodion (ʒss to ℥i—2 grammes to 30 grammes), salicylic acid dissolved in collodion (ʒi to ℥i—4 grammes to 30 grammes), glacial acetic acid, or lactic, nitric, or chromic acid. The tincture of thuya orientalis is praised as a specific for these tumors, which should be constantly moistened with it. An aqueous solution of tannin of the consistency of syrup, alum powder, equal parts of calomel and salicylic acid, or liquor ferri chloridi makes them shrink.

If the tumors are of medium size—up to an inch in diameter—they may be tied off with silk or rubber thread. If they are still larger, the galvanocaustic wire, with low heat, or Paquelin's thermocautery, is the best means for their removal.

It is not safe to cut them off with knife, scissors, or cold wire snare, as one might meet with a hemorrhage hard to arrest.

Besides the medical and surgical treatment great cleanliness should be inculcated. Vaginal douches and vulvar affusions, as well as hot sitz-baths, should be used several times a day.

VARICOSE VEINS.—The veins of the vulva, especially the labia majora, may swell so in consequence of pressure of the child against the pelvic veins as to form tumors of considerable size, even that of the fetal head. The swollen veins form dark blue, nearly black, globular, oval, or serpentine soft swellings, that collapse on pressure and refill immediately when the pressure is discontinued. They increase as pregnancy progresses, and grow smaller after the birth of the child; but often they do not disappear altogether. They cause an uncomfortable sensation of heat and heaviness, and sometimes pruritus. They may burst spontaneously, but usually that accident is due to injury or the passage of the child's head. If the skin holds, a subcutaneous hæmatoma is formed; if it breaks, a serious and sometimes fatal hemorrhage follows.

Similar varicosities are also found on the lower extremities and around the anus of pregnant women.

Treatment.—The patient should be directed to rest in a recumbent position in the middle of the day for at least an hour, and she may even manually push the uterus up, in order to relieve the pressure of the child against the pelvic veins. At times complete rest in bed or on a lounge is indicated. Fomentations with a lead-and-opium wash relieve tension and heat. A pad may be adapted with a spica in such a way as to exercise steady compression. The leg should be covered with a rubber bandage, for which after confinement may be substituted an elastic stocking. The patient should be warned against the danger of hemorrhage, and taught how to check it by compression until she can get help. When a rupture has taken place and the blood escapes, the hemorrhage should be controlled by means of deep sutures and an effectual outer pressure exercised with a towel rolled into a hard cylinder and kept in place with a rubber bandage. To plug the vagina might cause abortion.

Hemorrhoids.—The same internal pressure that causes varicose veins in the labia and the legs produces frequently hemorrhoidal tumors, which may cause considerable distress. They should be bathed with a sponge or pad dipped in hot water and smeared with an ointment made of unguentum gallæ, ℥i, and pulvis opii, ʒss, and they should be reduced as soon as possible.

HÆMATOMA, OR THROMBUS, is a swelling due to extravasation of venous blood in the connective tissue of the vulva. It is most common in the labium majus, and, as a rule, only one side is affected. Varicose veins predispose to it. The exciting causes are external violence, such as a blow, a kick, or a fall, and straining, especially during childbirth.

The hæmatoma may consist in a small swelling of the size of a hazel-nut or acquire the dimensions of a fist or a fetal head at term. It is of dark blue or purple color, and tender on pressure. The blood may become absorbed, or suppuration and even gangrene may set in. When the tumor becomes inflamed, swelling, tenderness, and heat increase, the skin takes a brighter purple color, the temperature rises, the pulse becomes full and frequent, and symptoms of septicæmia may develop. The swelling may interfere with micturition or childbirth. It may also burst, causing the dangerous hemorrhage just mentioned. As a complication of delivery it has proved fatal in twenty per cent. of cases reported.

Treatment.—A small hæmatoma may be let alone or treated with cold, astringent or absorbent fomentations (ice-bag, ice-water coil, lead-and-opium wash, arnica). If it is larger than a fist, it should at once be opened with a long incision, blood-clots turned out, bleeding arrested with sutures or forcipressure, and the cavity packed with iodoform gauze or styptic cotton. As soon as pus is formed, the hæmatoma should under all circumstances be opened and thoroughly disinfected.

MYOMA OF THE UTERUS.—Fortunately, most women with myomatous tumors, so-called fibroids, in their uterus are sterile, and, if they conceive, their pregnancy quite commonly ends in abortion or premature labor. Labor at term may be easy, but oftener the fibroid proves a dangerous complication. All depends upon the size and the situation of the tumor. A small tumor in the upper part of the uterus is of no importance, but if it is large or so situated as to encroach materially upon the parturient canal, especially the cervix, it interferes with the development or expulsion of the fœtus. During pregnancy the myoma increases in size and softens. After labor it becomes again smaller, and may disappear altogether. Women afflicted with myomatous tumors of the uterus should not marry. If they become pregnant, it is in harmony with nature's own method to induce abortion or premature labor, whenever the tumor is situated in such a place or has such dimensions that great trouble may be anticipated by allowing gravidity to go on till full term.

To operate for the removal of the myoma during pregnancy will be likely to lead to miscarriage. Unless there are urgent symptoms demanding immediate attention, such as hemorrhage or pressure on the pelvic organs, it is better to delay operative interference until labor sets in. After the end of the puerperium the question as to enucleation or hysterectomy or other treatment will present itself.

Diagnosis.—Pregnancy may be simulated by a myoma, and the diagnosis is not always easy. As a rule, menstruation stops during pregnancy, while in cases of myoma it goes on or is even increased in amount and duration. The development is regular and more rapid. The cervix and lower uterine segment become soft, the fluid in the fetal sac gives a peculiar sensation of tense elasticity, and ballottement may be elicited. The fetal heart-sound may be heard and fetal movements heard, felt, and seen. A point of great value is the contractility of the gravid uterus, which may be made more marked by dipping the palpating hand in ice-water. The uterine souffle is of less importance, since it may be found with myomas. Nor is the presence of milk in the breasts conclusive. The writer has seen milk produced in a virgin by an intra-uterine injection of diluted liquor ferri chloridi to check hemorrhage from a myoma.

The diagnosis becomes particularly difficult if the two conditions are combined, and, as we have seen, the detection of such a complication of pregnancy may be of great practical importance in regard to the treatment to be adopted. A suspicion of such a coincidence should be awakened by hemorrhages occurring during pregnancy. The use of the uterine sound is, of course, not available. The obstetrician must rely on the history of the case, the auscultation, and a very accurate palpation.

SARCOMA AND CARCINOMA OF THE UTERUS.—These are promiscuously called *cancer*, but there is a fundamental difference in their anatomical structure, the first being composed of round or spindle-shaped cells, the latter of polyhedral epithelial cells arranged in alveoli separated from one another by walls of connective tissue. Sarcoma rarely attacks the cervix, and is, therefore, of less importance to us as obstetricians than carcinoma, which has a predilection for that organ. Both undermine the constitution, and sooner or later, in most cases within a few years, lead to death. If, furthermore, we take into consideration that they may offer an unsurmountable obstacle to delivery and that the fœtus may inherit the tendency to, perhaps even the germ of, the disease from the mother, there is only one thing to do when we find cancer of the uterus in a pregnant woman. In this case it is not sufficient to sacrifice the fœtus. If we find the uterus in such a condition that a radical operation is still possible, especially when combined abdominal, vaginal, and rectal examination shows that there is no swelling of the broad ligaments and the womb is freely movable, total extirpation should be done at once.

The form of cancer with which the obstetrician most frequently has to deal, either during pregnancy or during labor, is carcinoma of the cervix. According to the period of pregnancy in which the cases come under observation, we may distinguish three groups, which offer different indications for treatment.

The first group comprises the cases in which the unopened and unemptied uterus can be extirpated from the vagina in the same way as a non-pregnant uterus.[1] This can, as a rule, be done without special difficulty until the end of the fourth month, and has even been done in the fifth and sixth. If the disease has spread too far to allow extirpation, a palliative operation, including abortion, should be performed.[2]

The second group is composed of most of the cases that are in the fifth, sixth, and seventh month. The uterus is too large to pass through the vagina while it contains the fœtus. Under these circumstances different operations are available:

First.—Abortion or premature labor may be induced, and as soon as the uterus is empty it is removed by vaginal section.

Second.—The whole uterus may be removed by abdominal section, but this involves great danger of infecting the peritoneal cavity with cancer germs, even if the cervix is curetted and cauterized before the operation.

Third.—It is better to perform supravaginal amputation and subsequently extirpate the cervix from the vagina.

Fourth.—Both the fœtus and the uterus may be removed through the vagina.

If the cancer is not operable and the child is near the period of viability, we may wait a short time so as to give it a chance; but if hysterectomy can be performed, it ought to be done at once, without regard to the child, for the carcinomatous degeneration spreads rapidly during pregnancy.

The third group encompasses the time when the child is viable. If the child is viable and the carcinoma operable, it is best to perform conservative Cæsarean section, close the uterus, tie the ovarian vessels, and then extirpate the empty uterus from the vagina.

---

[1] Garrigues, Diseases of Women, third ed., pp. 510–515.

[2] Ibid., p. 543.

If the child is viable but the cancer not fit for a radical operation, the cervix should be curetted and cauterized, and thereafter the woman delivered by Cæsarean section.

If the case does not come under observation before labor has begun and the cancer is operable, it may be possible to deliver a living child per vias naturales, either by means of a high forceps operation or podalic version followed immediately by extraction; but in order to gain room for the extraction of the child it may be necessary, after having loosened the uterus from the vagina and the bladder, to split the uterine wall in the median line or the anterior and posterior wall from six to ten inches above the internal os. This has been called *vaginal Cæsarean section*. After the removal of the child the uterus itself is extirpated through the vagina.

If the pelvis is so narrow as to make vaginal manipulations difficult, the total abdominal hysterectomy is indicated.

The immediate result of hysterectomy for carcinoma cervicis is satisfactory in so far as recovery from the operation is concerned, but it is quite exceptional that the patient lives more than three years after the operation.

The same method has been used in the sixth and seventh months of pregnancy, the anterior wall of the uterus being incised, the fœtus extracted, and then the uterus extirpated from the vagina.

The vaginal operation has the advantage of avoiding infection during the operation and an abdominal cicatrix; but if the child is alive, its chances are much better if it is delivered by abdominal Cæsarean section, whatever may be decided as to the best way of removing the uterus.

OVARIAN CYST.—*Diagnosis.*—Many a poor girl has been exposed to the suspicion of having sacrificed her virtue when in reality she was suffering from an ovarian cyst. The physician should, therefore, use every means of clearing the diagnosis. As a rule, menstruation stops in pregnancy and continues in the person who has an ovarian cyst. The ovarian tumor grows more slowly than the pregnant uterus. It may be felt as a separate mass only indirectly connected by a pedicle with the uterus, while in pregnancy tumor and cervix are so intimately connected that they move together. Pregnancy is characterized by numerous signs, especially the fetal heart-sound and the uterine souffle, fetal parts may be felt, fetal movements may be observed, ballottement may be produced, the cervix and lower uterine segment are softened, the vagina has a purplish color, often a drop of fluid may be pressed from the breasts,—all of which signs are lacking in connection with an ovarian cyst.

But a pregnant uterus and an ovarian cyst may be found combined and make the diagnosis very difficult. This complication of pregnancy is not very rare, and may influence the treatment considerably. It may occur even when both ovaries form large tumors, and so much more so when only one is affected. As a rule, there is no menstruation. The ovarian tumor may be known to have existed before pregnancy began. Otherwise only a most careful abdominal and vaginal examination, combined with due reference to the oft-named symptoms, can clear up the diagnosis. When the presence of one child is made out, the investigation must next be directed towards the second mass, with a view to ascertain whether the case is simply one of twins or of uterogestation combined with an ovarian tumor.

The complication with an ovarian cyst may give rise to intolerable suffering, on account of the distention of the abdominal wall and compression of the thoracic organs. The growing uterus may cause torsion of the pedicle of the ovarian cyst, an extremely dangerous condition.

Treatment.—The simultaneous growth of the pregnant uterus and an ovarian cyst will, in most cases, be a source of so much discomfort, or even be attended by such dangers, that interference is called for during pregnancy. Three methods are then at our disposal: 1, artificial abortion or induction of premature labor; 2, tapping the cyst; 3, ovariotomy. The writer does not think this complication is sufficient to indicate artificial abortion, the other means being at our disposal. If possible, we should wait until the child is viable, preferably even until the thirty-sixth week of pregnancy, and then induce labor. Tapping has given excellent results as a palliative measure, to be followed by ovariotomy after the puerperium is over; and there is no serious objection to it, provided it is performed by a man prepared to do ovariotomy if untoward sequences should develop. Ovariotomy has been performed many times during pregnancy. The dangers of the operation are very slightly increased; but often it is followed by miscarriage. It is, therefore, best to postpone it until after the puerperium, and during pregnancy be satisfied with induction of premature labor or tapping the cyst,[1] or at least to defer the operation until the child is fully viable.

Operations during Pregnancy.—In general, operations should as far as possible be avoided during pregnancy, on account of the danger of producing abortion. It seems that interference with the rectum is particularly liable to have this effect. As to the genitals, the farther the seat of the operation is removed from the uterus the less is the danger of provoking abortion. Sometimes, however, operations may be imperatively indicated by the pregnancy itself, as in cases of ectopic gestation; or the advantages to be obtained by an early operation may be so great that it should be performed, even if we have to sacrifice the child,—for instance, the removal of an ovarian cyst or the extirpation of the cancerous uterus. I also allow minor operations on the teeth, such as filling of carious cavities and even avulsion, if the affected tooth causes much distress.

---

[1] As for the *modus operandi* see Garrigues, Diseases of Women, third ed., pp. 197, 640.

§ 5. **Displacements.**—ANTEFLEXION.—Anteflexion of the uterus opposes a much more serious obstacle to impregnation than one would expect, when one thinks of cases of pregnancy occurring under the most unfavorable circumstances,—for instance, stenosis of the hymen or vagina, leaving only a hardly visible aperture for the entrance of the spermatozoids, or even total atresia, and communication between the uterus and the rectum, through which latter organ copulation took place. Still, there cannot be any doubt about the correctness of the statement that anteflexion is a barrier to conception, since we are so often consulted by women with this deformity who are in perfect health, but sterile, and the excellent effect of operations by which an easier access to the uterine cavity is opened for the spermatozoids.

Again, if a woman suffering from anteflexion conceives, there is danger of miscarriage or severe vomiting during pregnancy, which may interfere so much with the general nutrition that it becomes necessary to induce abortion artificially.

On the other hand, pregnancy, if it goes on to term, is the radical cure for anteflexion.

There is not much to be done for anteflexion during pregnancy, except to recommend the dorsal posture and after the end of the third month, when the fundus of the uterus reaches the abdominal wall, the use of an abdominal supporter. Excessive vomiting will be considered later.

ANTEVERSION is hardly of any interest to the obstetrician. It offers little obstacle to conception and hardly any to the rising of the impregnated womb, except when this has been artificially fastened to the vagina in operations for retroflexion, in which case it may give rise to a most formidable complication of labor, which will be considered later.[1]

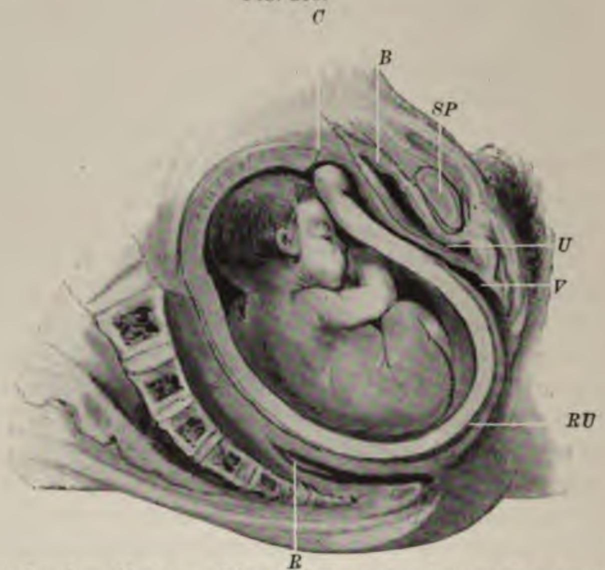
RETROFLEXION OF THE UTERUS.—In retroflexion the genital canal seems to have a direction more favorable to conception than in anteflexion. While patients afflicted with the latter quite commonly are sterile, those in whom the uterus is bent the other way often have large families. As a rule, the uterus rises gradually out of the pelvic cavity, and the retroflexion changes into the physiological anteflexion; but sometimes the retroflexed uterus becomes *impacted*, and then we have to deal with a very dangerous condition (Fig. 259).

---

[1] Antedisplacements are described in Garrigues, Diseases of Women, third ed., pp. 453–465.

The first symptom that brings the patient to seek the advice of the doctor is, as a rule, retention of urine. Constipation is also present and some pelvic pain. On vaginal examination the retroflexed enlarged uterus is felt pressing on the rectum. In neglected cases the whole mucous membrane of the bladder has been thrown off in one piece by a diphtheritic process in the submucous connective tissue. The pregnancy may terminate in spontaneous abortion or the bladder may rupture and the patient die from peritonitis, uræmia, gangrene of the bladder, or septicæmia.

FIG. 259.

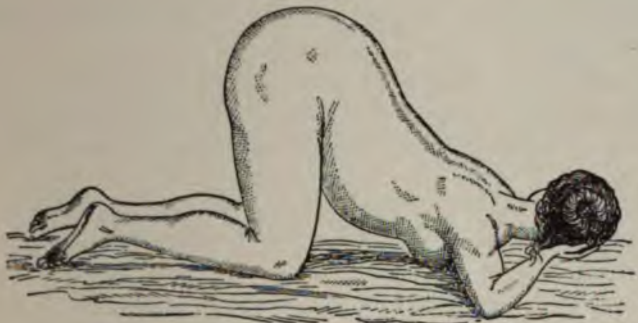


Impaction of retroflexed gravid uterus. (Schatz.) *R U*, retroflexed uterus; *R*, rectum; *B*, bladder; *C*, cervix uteri; *V*, vagina; *U*, urethra; *S P*, symphysis pubis.

In rare cases a part of the posterior wall of the uterus remains in the pelvis, a condition called *partial retroflexion of the gravid uterus*. Then the uterus and the fœtus are felt partially above the symphysis and partially in the vagina. This condition, as a rule, does not offer any difficulty, but may exceptionally end in abortion or premature labor between the sixth and the eighth months.

Treatment.—First the bladder should be emptied with the catheter. Next, the faulty position of the uterus should be corrected as soon as possible. In most cases this can be done by placing the woman in Sims's position and introducing the index and middle finger with the volar surface turned back towards the physician. The replacement should be tried in the corners of the pelvis, in front of the iliosacral joint, where there is most space. If it does not succeed, the patient should be placed in the knee-chest position (Fig. 260) and a cotton tampon held in forceps should be substituted for the fingers. When the uterus has been replaced, it should be kept in its new position and prevented from falling back again by means of a large Hodge-Emmet or Albert Smith pessary (Fig. 261), which should be worn till the end of the fourth month, when the uterus has acquired such dimensions that it can no longer become retroflexed.

FIG. 260.

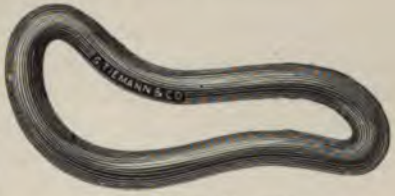


Genupectoral position. (H. F. Campbell.)

If the uterus is not easily replaced, the patient should be anæsthetized. If manual reposition through the vagina does not succeed, the hand may be passed through the rectum, which sometimes is more effective, and replacement may be seconded by pulling the cervix down from the vagina with the fingers or bullet-forceps.

Another principle, that of steady elastic pressure, has been successfully applied to the reposition of the retroflexed uterus. It may be exercised by means of *Braun's colpeurynter* or any other rubber bag such as the one delineated in Fig. 417. After having been disinfected it is introduced into the vagina against the fundus uteri and filled with as much sterilized water or lysol emulsion as the patient can bear. If the patient cannot urinate, the urine is drawn with catheter or the bag is momentarily emptied. The same principle is employed more effectively in *Aveling's repositor*. This consists of a little hard-rubber cup which presses against the fundus, and an S-shaped rod which protrudes from the vulva and carries pressure made at the

FIG. 261.



Hodge-Emmet pessary.

lower end up in the direction of the pelvic axis. To this lower end are attached four elastic cords which are drawn through rings fastened to a binder surrounding the abdomen. Two of the cords are brought forward and two backward, enabling us to press in the right direction. This apparatus has the advantage over the colpeurynter that the distention of the vagina, which is not only painful but also might cause abortion, is avoided.

If all attempts at reposition are fruitless, the uterus should be punctured from the vagina and the liquor amnii aspirated, which, as a rule, gives immediate relief from pressure, but is soon followed by abortion.

Retroversion of the uterus is comparatively rare, and if a retroverted uterus becomes impregnated it gradually changes into retroflexion or retroflexion combined with retroversion.[1]

Prolapse and Procidentia of the Uterus.[2]—No case of pregnancy in a completely prolapsed uterus at term is known, but the condition has been observed and described at an earlier stage. On the other hand, pregnancy in a partially prolapsed uterus which still remains in the vagina and the pelvis is not very rare. Sometimes the prolapse is more apparent than real, a considerable hypertrophy of the cervix, especially the supravaginal portion,[3] making the cervix appear outside of the vulva, while the body of the uterus is in or above the pelvis.

When the uterus grows, as a rule, it is drawn up until it is so large that it cannot re-enter the pelvic brim, so that women with this affliction are comparatively free from it during their pregnancy, and pregnancy and labor pass off without disturbance.

In the earlier months of pregnancy the uterus may by some accident be suddenly propelled outside the body. Then it becomes œdematous, blood is extravasated around or in the ovum, and the woman aborts.

Treatment.—The prolapsed uterus should be brought back to its place, and in so doing we should take particular care to bring the fundus forward, as otherwise it is very apt to go backward and constitute a retroflexion. This reposition is, as a rule, easy enough, but not so the retention. The vagina being enormously dilated and softened, and all tissues that normally hold the uterus in place being relaxed, the uterus sinks down again. Common pessaries find no support. Sometimes a large thick rubber ring (Mayer's pessary) may be able to retain the uterus in place, or a cup and stem pessary attached to an abdominal supporter may be able to do so. If not, the patient must be kept in a recumbent position until the uterus becomes so large that it can no longer fall down.

---

[1] Information about the retrodisplacements is found in Garrigues, Diseases of Women, third ed., p. 464 and following.

[2] Ibid., p. 478.

[3] Ibid., p. 446.

When the cervix is so much hypertrophied that it may be expected to oppose a serious obstacle to the passage of the child, it may be amputated during pregnancy.

Œdema of the Cervix.—During pregnancy, labor, and even after delivery, the cervix may become œdematous and form a large soft swelling. It is rather towards the end of pregnancy than in the first months that this condition has been observed. The patients complain that something is coming out of their genitals during straining or in walking, which again disappears during rest. Besides they may be constipated or find difficulty in urinating.

At the vulva, partially protruding from it, is found a tumor of red or bluish color, soft, reducible on pressure, which proves to be the swollen cervix. The finger may be introduced through the cervical canal, which is found much elongated and measuring from three to four inches.

The cause of this œdema is not always clear, but sometimes pressure exercised by a tumor in the pelvis on the lower uterine segment accounts for it. The disappearance of the swelling during the recumbent position distinguishes it from hypertrophy, and the normal situation of the fundus from prolapse.

The condition is of importance since it is apt to lead to premature labor.

Treatment.—The swelling should be reduced by pressure in the recumbent position, and then a couple of tampons should be placed in the vagina and kept in place with a T bandage. The patient should be kept in a recumbent position, and if she is constipated her bowels should be moved.

Partial Œdema.—Sometimes the œdema affects only a part of the cervix, especially the anterior lip. Thus a tumor may be formed that interferes with the birth of the child.

Hernia Uteri, or Hysterocele.—In exceedingly rare cases the uterus is found forming the contents of a hernia, femoral, inguinal, or umbilical.

The fœtus may be carried to term in this abnormal situation; but if the case comes under observation during pregnancy before the child is viable, the uterus should be cut down upon and removed by abdominal hysterectomy.[1]

At the end of pregnancy, the uterus should be incised and the child taken out as in Cæsarean section performed when the uterus is in the abdominal cavity. As to the uterus, it may either be left till after involution has diminished its volume and blood supply or replaced into the abdominal cavity or extirpated at the level of the cervix,—Porro's operation, which will be described later.

---

[1] Garrigues, Diseases of Women, third ed., p. 517.

The pregnant uterus may be found in a ventral hernia, which may have existed before impregnation took place or which may have been formed during pregnancy by the distention of the growing uterus. These cases are not rare in women upon whom laparotomy has been performed.[1] Either the edges of the wound were not properly brought together, or suppuration set in, or the cicatrix formed at the time became wider and thinner by subsequent intra-abdominal pressure. In these cases the recti muscles separate in the median line, and form concave edges when the woman lies on her back and tries to raise her chest. In the gap we feel under the thinned skin the abdominal contents—intestines, uterus, ovaries and tubes—with unusual distinctness.

For these patients there is nothing to be done except to let them wear a well-fitting abdominal supporter. After their puerpery the gap in the abdominal wall may be closed by a secondary operation, in which case union of the aponeurosis by the cobbler's stitch is particularly recommendable.[2]

Ectopic Gestation.—As we have seen above, the fertilized ovum is destined to be embedded in the mucous membrane of the uterine cavity, but, unfortunately, by one of the saddest errors of nature, it may also develop in the ovary or the tubes. This condition used to be known as *extra-uterine pregnancy;* but since the development may take place in that part of the tube that traverses the uterine wall, the modern name *ectopic gestation* is preferable. It is by no means a rare condition, as appears by a research of medical journals during the last thirty years and the material that comes under observation in hospitals, lying-in institutions, and the private practice of gynæcologists.

Ectopic gestation may be divided, according to the place in which the fœtus develops, into *ovarian*, *tubal*, *tubo-ovarian*, *tubo-uterine*, or *interstitial*, *uterotubal*, and *secondary abdominal pregnancy*, of which the tubal is the most common.

Ovarian pregnancy is a rare form, in which fertilization takes place in the ovum while it is yet retained in the interior of the Graafian follicle. But how do the spermatozoids get there, and why does the ovum stay there? We can imagine two roads the spermatozoids may take,—either through the corresponding tube, and that is doubtless the common way, or, if that is impervious, through the tube of the opposite side, by so-called external migration of the semen. The ovary is often the seat of chronic inflammation, which has resulted in adhesive masses surrounding the ovary like a rind. The ripe follicle may nevertheless open on its surface, admitting the spermatozoids, but the adhesions may offer an obstacle to the escape of the ovum. The opening in the follicle may remain open after the ovum has been fecundated, and then the fetal sac may develop without hinderance in the abdominal cavity; or it may close, when the whole fetal sac will be developed within the narrow space of the ovary itself, whose distensibility is limited, and which will at an early date rupture under the pressure from within.

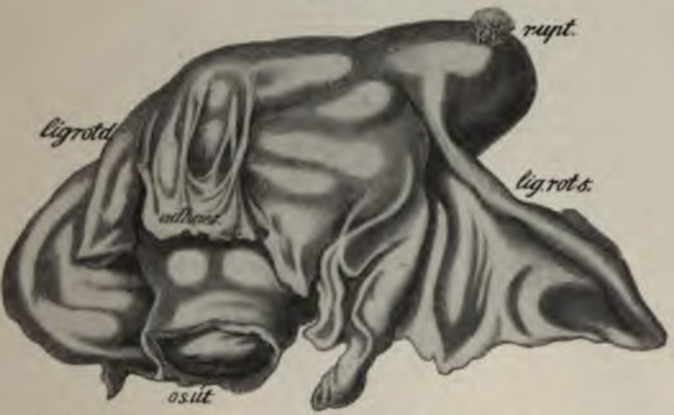
---

[1] Garrigues, Diseases of Women, third ed., p. 643.

[2] Garrigues, ibid., p. 649 ; "Secondary Operations," Trans. Amer. Gyn. Soc., 1897, vol. xxii. ; Annals of Gynæcology and Pædiatrics, Boston, 1897.

The anatomical proof that an ectopic gestation has its seat in the ovary consists in the presence of both tubes, the absence of one ovary, the ovarian ligament ending in the fetal sac; and sometimes even follicles and ova have been found in the fetal sac, elements which are purely ovarian in character.

FIG. 262.



Interstitial, or tubo-uterine, pregnancy. (Mayer.) *rupt.*, place of rupture in the wall of the left horn of the uterus, with protruding villi of the chorion; *lig rot d*, right round ligament; *lig.rot s.*, left round ligament; *os ut.*, os uteri.

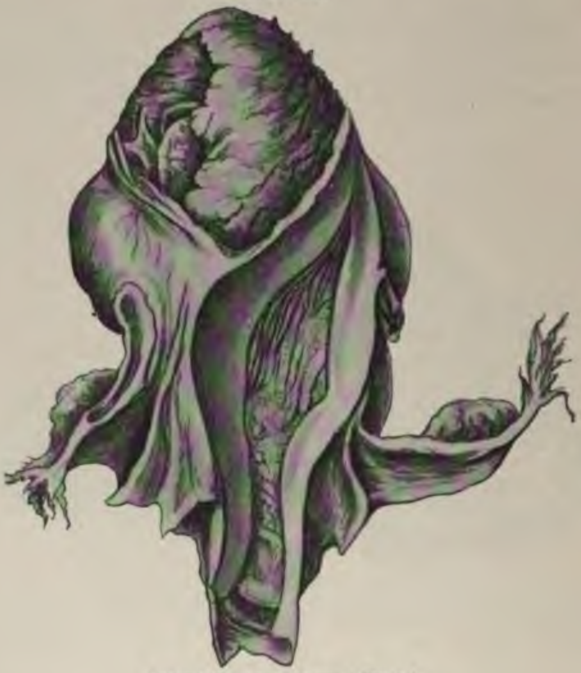
The tubo-ovarian variety is still rarer than the purely ovarian, being possible only when the tube was adherent to the ovary before impregnation and a follicle bursts in such a place that the spermatozoids can reach its interior. In this variety the fetal sac is formed partially of the ovary and partially of the fimbriated end of the tube.

The interstitial or tubo-uterine pregnancy (Fig. 262) is also very rare. It develops in the innermost part of the tube, which lies in the wall of the horn of the uterus. This is not extra-uterine, since the development takes place in the wall of the uterus; but it is ectopic, because the sac is not developed in the cavity of the uterus, its normal place.

This form may be very like a case of pregnancy in the rudimentary horn of a uterus unicornis; but the distinctive feature is that only one side of the uterus develops and the fundus thereby becomes almost perpendicular (Fig. 263), while in the rudimentary horn of a unicorn uterus just the opposite is the case: the fundus is transverse and wide and the appendages start from the top of the well-developed horn (Fig. 264).

Both these varieties of pregnancy differ from a tubal pregnancy by being situated inside of the round ligament, whereas in tubal pregnancy the tumor is developed outside of the point of insertion of this ligament.

FIG. 263.



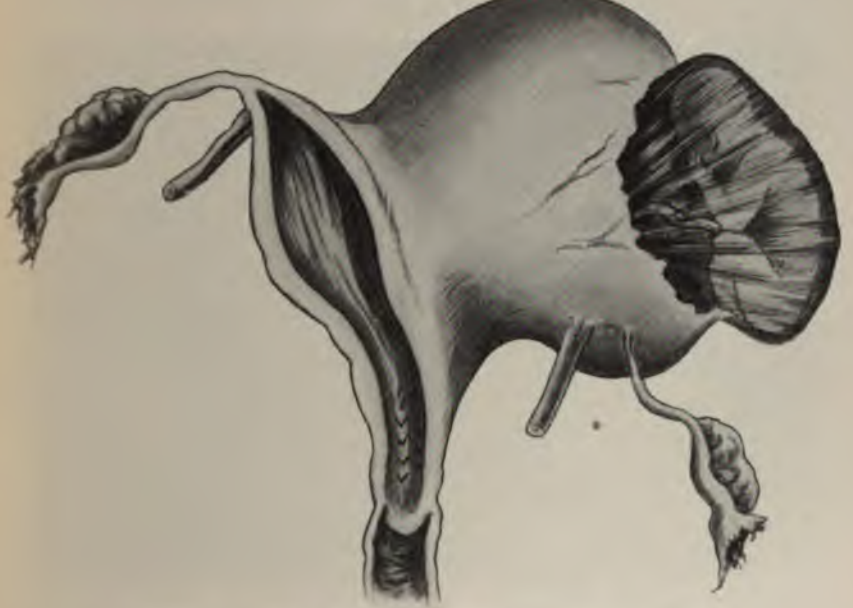
Interstitial pregnancy. (Ruge.)

When the interstitial sac grows, it may extend into the uterine cavity, and thus approach the condition of a normal pregnancy; or, on the other hand, it may enter the free part of the tube, forming the variety known as *uterotubal pregnancy*, which practically is the same as the purely tubal pregnancy, except in so far that the uterine wall is implicated.

Far more common than any of the varieties so far described is the true *tubal pregnancy* (Fig. 265), where the ovum is embedded on the mucous membrane of the tube itself—the isthmus, ampulla, or fimbriæ,—and most commonly, again, not, as one might be inclined to expect, *a priori*, in the narrow isthmus, but in the comparatively wide ampulla. As to the fimbriated end, either the whole may form a flat cup on which the ovum is implanted like an acorn in its involucre, or the ovum may have been embedded on the long fimbria ovarica that extends from the ovary to the tube.

Ætiology.—For tubal pregnancy to occur, it must be possible for the spermatozoids to pass, and, on the other hand, there must be an obstruction which retains the fertilized ovum on its way to the uterine cavity. In this respect we remember that the spermatozoid in its full length is five times smaller than the diameter of an ovum, and consequently it may pass through a many times smaller opening. Furthermore, the spermatozoid possesses a very lively movement of its own, which pushes it in the direction of the inner genitals, whereas the ovum is inert and must depend for its transportation on the movement of the cilia of the cells lining the tubes. A mere retardation in this movement may therefore perhaps suffice to cause the ovum to become embedded on the mucous membrane of the tube, and, of course, still more so a loss of cilia or of part of the epithelium. Now, pathological anatomy teaches that in cases of ectopic gestation we sometimes find the tube taking an unusually winding course, and that quite frequently

FIG. 264.

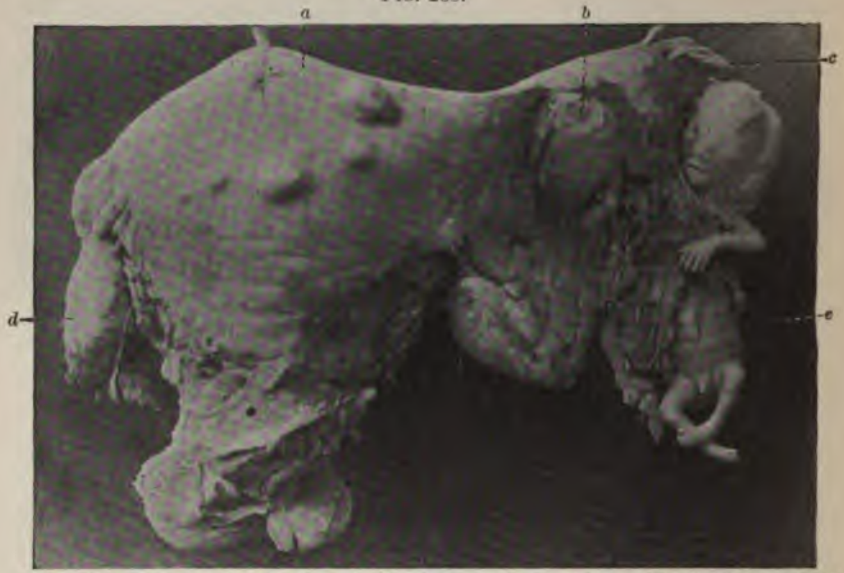


Uterus unicornis with pregnancy in the rudimentary horn. (Ruge.)

there is a catarrh of the tube, or even a pyosalpinx; and still more frequently the tube is covered with peritonitic adhesions, which distort its course or form kinks and constricting bands, all of which would tend to place obstacles in the way of the normal migration of the ovum from the ovary to the uterus. It has also been noticed that multiple fetation is found with comparative frequency in ectopic gestation, which makes one think that perhaps two or three ova try to pass the tube at the same time and become impacted in its narrow canal and among its deep folds.

It has also been noticed that ectopic gestation is much more common among women who have borne children than among primiparæ, the cause of which is undoubtedly to be found in the healthy condition of the genital canal of these latter, while in the former childbirth itself and other nosogenic influences may have become the source of tubal catarrh, pyosalpinx, and perimetric inflammation. We find particularly ectopic gestation in cases of secondary sterility,—that is to say, a woman gives birth to a child, then she does not conceive, or at least no pregnancy develops for several years, and when she, finally, conceives again the ovum is arrested before reaching the uterine cavity. Tubal pregnancy is much more common on the left side than on the right, which probably is due to pressure from the rectum and the

FIG. 265.

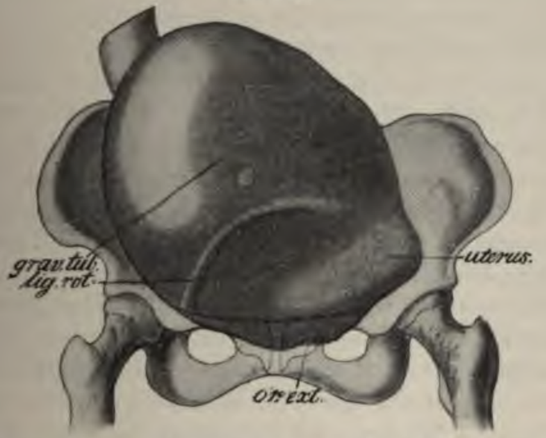


Tubal pregnancy, ruptured at the end of the third month of gestation. (Wood's Museum, Bellevue Hospital, No. 1219.) *a*, uterus seen from behind, containing several myomas; *b*, right ovary; *c*, ruptured tube; *d*, left ovary; *e*, fœtus.

absence of a valve in the left ovarian vein, and its débouchure in the renal vein at a right angle.

Development.—The mucous membrane of the tube swells and forms a decidua, the epithelial cells are lost, while a proliferation of connective-tissue cells takes place and the large decidual cells are formed. The muscular coat of the tube undergoes also a development, but it cannot keep pace with the growth of the fetal sac, the muscular bundles become separated from one another, and the whole wall becomes so thin that, unable to withstand the expansion any longer, it ruptures. Most frequently the rupture supervenes in the third or fourth month of gestation, rarely in the first or second, and still more infrequently after the fourth. If this rupture takes place downward, the blood may enter between the two layers of the broad ligament and lift the peritoneum from the abdominal wall, but finding considerable resistance in this closed cavity, it ceases to flow, coagulates, and forms a *hæmatoma*. The fœtus may continue to develop in this locality, constituting a large *intraligamentous* tumor (Fig. 266). If, on the other hand, the rupture takes place upward and the tear goes through the placenta, the blood may inundate the peritoneal cavity and the patient may bleed to death in a very short time by *intraperitoneal hemorrhage.* But the rupture may take place before the placenta is developed or it may not implicate this organ. The quantity of blood lost may be small; it may flow slowly and even with intervals. There may be old adhesions in the neighborhood of the rift. Under these favorable circumstances the blood may become encysted, the intestines, the omentum, the uterus, and the wall of the pelvis becoming

FIG. 266.



Intraligamentous tubal pregnancy. (Schauta.) *Grav. tub.*, tubal gravidity; *lig. rot.*, round ligament; *or. ext.*, orificium externum.

agglutinated and forming a roof over the extravasated blood, a condition which is called *hæmatocele.*[1] Finally the blood may coagulate and by peristaltic movement be smeared all over the intestines and the walls of the peritoneal cavity, where it is gradually absorbed by the lymphatics.

Wherever the ovum is embedded, the uterus participates in the development. Although empty, it increases in size by the usual muscular hyperplasia and hypertrophy, and a decidua forms. Later, but, as a rule, within the first three months, this irritates the uterus as a foreign body, contractions are elicited, and the decidua is thrown off in shreds or as a continuous cast of the uterine cavity, which process is accompanied by more or less uterine hemorrhage.

The tubal decidua vera is less perfect than that normally formed in the uterus. A reflexa forms also, but does not cover the whole ovum. A placenta is developed, the maternal blood being furnished by the enlarged tubal blood-vessels.

Another way in which the tube rids itself of the fœtus is by pushing it to one of its ends. By peristaltic movements the ovum may be thrust into the cavity of the uterus, whence it may immediately be expelled through the os, or it may be retained for months in the uterine cavity until it is expelled by abortion, or it may even be carried and continue growing till a time when the child may be born alive by a normal labor.[2] But all this is likely to happen only in cases of tubo-uterine pregnancy or at least in cases of tubal pregnancy where the ovum is embedded in the inner part of the tube. If it is implanted near the fimbriated end, it is more liable to be pushed through the abdominal opening of the tube and fall into the abdominal cavity, a process which aptly has been dubbed *tubal abortion.* It occurs, as a rule, within the first three months of pregnancy. It may take place suddenly, and *complete tubal abortion* is then apt to be accompanied by severe, even fatal, cataclysmic, intraperitoneal hemorrhage; or the ovum may gradually be loosened and pressed into the abdominal cavity—so-called *protracted tubal abortion.* Then the condition is much like that described above as being found in certain cases of rupture of slow formation. The hemorrhage is moderate, the blood finds time to coagulate, protective adhesions encyst it, and the result is a hæmatocele. Tubal abortion is commonly accompanied by uterine hemorrhage.

In cases of rupture the whole fetal sac may burst and the naked fœtus fall into the abdominal cavity. If it is small, it may be entirely absorbed, as shown experimentally by placing young fœtuses of rabbits into the peritoneal cavity, and proved by the frequent absence of a fœtus while parts of the placenta are found. The fœtus becomes invaded by colorless blood-corpuscles and disappears without leaving a trace. Larger fœtuses may be preserved for many years, so that the organs and even the microscopical structure remain unchanged. Or by incrustation with lime salts the fœtus may be changed into a stony mass—a *lithopædion*. This incrustation may take place in the skin and other soft tissues of the fœtus itself or in the surrounding fetal sac or in both together. Such a lithopædion has been carried for half a century in the abdomen. Sometimes the soft parts of the fœtus undergo *lipoid degeneration*,—that is, they are changed into a fatty mass like that adipocere that often is found in bodies that have long been buried.

---

[1] See Garrigues, Diseases of Women, third ed., p. 686.

[2] Garrigues, "Extra-uterine Pregnancy changed into Intra-uterine," Medical News, December 12, 1885.

More commonly, however, the fœtus and ovum undergo suppuration or putrefaction and disintegration; fistulous tracts form through the abdominal wall, into the intestine, the vagina, or the bladder, by which ways the bones of the skeleton may be expelled; and finally recovery may take place if in the mean time the patient does not succumb to peritonitis or sepsis.

At the time of rupture the fœtus may also remain in the intact amnion and the ovum retain its connection with its original point of embedding in the ovary or the tube. Then it may continue to grow until the normal term,—*secondary abdominal pregnancy*. At term labor-pains set in, the fœtus dies, chiefly from hemorrhage at the placental site, and may undergo any of the changes just mentioned,—suppuration, putrefaction, mummification, or petrifaction.

As to the blood poured into the abdominal cavity or into the connective tissue of the pelvis and the abdominal wall, it may be absorbed, or it may form an abscess, or in rare cases the cyst in which it is contained may secondarily rupture into the peritoneal cavity.

In exceptional cases the fœtus may remain in the tube, neither rupture nor tubal abortion occurring. It may be carried till the end of normal pregnancy; the liquor amnii is then evacuated through the uterus, and the fetal sac and fœtus undergo one of the above-described changes. The germs causing suppuration or putrefaction may find their way in through the uterus or be derived from a pyosalpinx or by invasion from the intestinal tract. Much more commonly, however, the fœtus dies at an earlier period and may remain in the tube; the liquor amnii is absorbed, the fœtus, membranes, and extravasated blood form together an oblong mass called a *fleshy mole*. Occasionally it has also been found changed into a hydatid mole, which will be described later. Or the fœtus may, even after its death, act as a source of irritation, cause hemorrhage in its surroundings, and finally lead to rupture of the tube.

While the fœtus remains living in the tube, it is exposed to abnormal pressure in its close quarters, which may explain why malformations are comparatively common in ectopic gestation.

Tubal pregnancy may be bilateral or there may be found two fœtuses in the same tube.

Symptoms.—Ectopic gestation may take its course to full term without any symptoms calling the patient's attention to her dangerous condition, until finally labor pains set in and no child appears. But much more commonly some kind of unusual accident brings her to seek medical advice, especially attacks of severe pain in the lower part of the abdomen, a pain that may be so violent that if standing up she sinks right down on the spot, unable to take a single step. At other times it is loss of blood from the vagina that brings her to the physician. Often the patient complains of dysuria, dyschezia, or dyspepsia, or a watery fluid is discharged. If this can be examined, the characteristic microscopic appearance of liquor amnii will at once settle the diagnosis of pregnancy. Otherwise it may have been hydrorrhœa. If shreds of the decidua or the whole of this membrane has been thrown off, the presence of decidua cells likewise makes the diagnosis of pregnancy certain. Sometimes we find the symptoms of local peritonitis, —fever and swelling.

If called to see the patient when rupture or tubal abortion has taken place, we may find her in collapse, with a sensation of a warm fluid entering her abdominal cavity; faintness, nausea, vomiting; a frequent small or imperceptible pulse; a subnormal temperature; dyspnœa; pallor; cold clammy extremities. Often blood is flowing from the vagina. The abdomen is distended and very sensitive. Consciousness is preserved, and the patient feels that her life is ebbing away.

Diagnosis.—In trying to diagnosticate the case, we should first find out if the patient is pregnant, by passing in review all signs of this state. If a regularly menstruating woman skips one or more periods, the probability is that she is pregnant. If she has borne a child before and then been sterile for years, the suspicion of ectopic gestation should be awakened.

We may feel the uterus soft and enlarged, but not so much as we would expect from the time elapsed since the last menstruation. Attacks of pain and irregular discharge of blood make it more likely that we have to deal with ectopic gestation. The discharge of liquor amnii or of decidua, if at the same time we can ascertain that the uterus is empty, makes it sure. Sometimes we can prove the emptiness of the uterus by bringing the index-finger through the soft, open cervix. In other cases we come to the same conclusion by the use of the sound, which enters with the greatest ease and can be turned in all directions without meeting with any resistance. But we would not dare to use the sound until we have felt a round or oblong, elastic, soft, and sensitive tumor outside of the uterus. Even then the sound should be used with the greatest possible gentleness, in order not to call forth contractions of the fetal sac and thereby perhaps cause a rupture or a tubal abortion, which in several cases has proved fatal.

For the same reason it is contraindicated to use the curette for obtaining some of the uterine decidua. In the menstrual decidua there are also large cells, but by far not so large as in pregnancy.

In making the differential diagnosis of a tumor, we should think of chronic or acute salpingo-oöphoritis, but as a rule the history will differ sufficiently to avoid a mistake. After the middle of the fifth month we may be able to hear the fetal heart-sound outside of the uterus. We may be able to hear a souffle in two distinct places,—over the side of the uterus and over the fetal sac. We may be able to feel fetal parts. In more advanced cases the fœtus is felt much nearer the tips of the examining fingers than when the uterine wall lies between it and the abdominal wall.

In differentiating the case, we should also bear in mind the possibility of a *combined intra-uterine and extra-uterine pregnancy*, of which quite a number has been reported.

Sometimes the diagnosis is so obscure that even men with considerable experience may err. Thus, the writer and another gynæcologist made the diagnosis of ectopic gestation in a case which, when I operated on it, proved to be a double dermoid ovarian cyst complicated with pregnancy. The bony parts of the dermoids had been taken for fetal bones, while the upper part of the uterus was covered by the tumors and appeared small.[1]

In some cases the round ligament may be felt, and its relations to the sac may make it clear that the tumor is situated in the tube. As long as the fœtus is living the tubal tumor is soft, but after its death it becomes hard and is then less easy to diagnosticate.

Prognosis.—The prognosis for the fœtus is bad, wherefore it deserves so much the less to be taken into consideration. The danger for the mother is so great that everything should be done in her favor, and the life of the child should have no weight unless it can be saved without increasing the danger incurred by the mother. The prognosis for both mother and child has, however, improved enormously through the development of abdominal surgery.

Treatment.—Opinions of competent men differ so much in regard to the best treatment of ectopic gestation that in a work of the scope of the present it is not possible to enter into a detailed argument with reference to the reasons alleged for one or the other mode of treatment. I must limit myself to stating how in my opinion the different classes of cases should be treated. In a general way it may be said, that most of these cases are so serious that they should not be made the occasion of a display of surgical dexterity, but that the simplest means by which the patient's life may be saved should have the preference.

---

[1] Garrigues, "A Case of Double Ovariotomy during Pregnancy," The Clinical Recorder, vol. i., No. 2, April, 1896, p. 49.

The method of killing the fœtus by *injecting* into it morphine or other poisons must be looked upon as entirely obsolete. In the judgment of most obstetricians this statement also applies to the use of *electricity* for the same purpose, and I seize this opportunity to revoke nearly all that I in former years said on the subject.[1] Nevertheless, the fact that all other methods frequently have led to the patient's death, whereas electricity very rarely has proved fatal, and the fact that very young fœtuses may be totally absorbed, make me hesitate in following other authors in their absolute condemnation of a method that has given excellent results in the hands of some of the best American obstetricians and gynæcologists. But with our present knowledge of the possible dangers lurking in the retention of a dead fœtus in the tube, and with our greatly improved technique in cutting operations, I think the method should be limited to the first two months of pregnancy. It seems to be immaterial whether the constant current with slow interruptions or the faradic current be used, but as strong a current as the patient can bear without an anæsthetic should be applied, the sitting should not be shorter than ten minutes, and it ought to be repeated daily until all signs of pregnancy have disappeared.

The first effects of electricity are to cause the tumor to become much smaller and harder by absorption of liquor amnii, and the breasts to become flaccid.

With this slight and very limited exception, and with the exception of certain cases of hæmatocele, the treatment of ectopic gestation must be surgical.[2]

The operations that may be called for are vaginal incision; laparotomy, with or without extirpation of the fetal sac; vaginal panhysterectomy; abdominal panhysterectomy; incision above Poupart's ligament; perforation of the fetal sac through the uterus; cleaning and suturing of the tube.

Vaginal incision is indicated in cases of hæmatocele, when the tumor impinges on the vagina; thrombus; suppuration or sepsis, when easily reached from the vagina.

---

[1] Garrigues, "Electricity in Extra-uterine Pregnancy," Trans. Amer. Gynæcol. Soc., 1882, vol. vii. pp. 184–218.

[2] The labor of the author has been much facilitated by the lucid and unbiased report submitted by Paul Segond to the Periodical Congress of Gynæcology, Obstetrics, and Pædiatrics, Paris, 1898.

Laparotomy is indicated, (*a*) with removal of sac, in uncomplicated cases until the end of the fifth month, and in hæmatosalpinx: (*b*) without removal of sac, in hæmatocele with repeated bleeding; in free intraperitoneal hemorrhage; and with suppurating sac or sepsis, if the tumor is more abdominal.

Vaginal panhysterectomy is indicated until the end of the fourth month if the other set of appendages is diseased or the uterus is the seat of a myoma or cancer.

Abdominal panhysterectomy is indicated under the same circumstances after the end of the fourth month; it may also become a necessity in order to control hemorrhage.

A very wide scope must be left to the judgment of the surgeon in the choice of the treatment best adapted to the particular case, in which respect the condition of the patient claims close attention. But as a guide some general rules may be laid down as the outcome of the united experience of the profession. First of all it must be impressed on the mind of the general practitioner that the treatment of ectopic gestation is nearly always surgical, that in most cases prompt interference is called for, and that great technical difficulties may be encountered in the operation. He should, therefore, as soon as he has made the diagnosis, or even if there is only a suspicion of ectopic gestation, secure the help of an operating gynæcologist or a surgeon familiar with abdominal work, or place the patient under the care of some institution in which that kind of work is done.

The cases may be divided into two large classes, those belonging to the first five months of pregnancy and those that come under observation later, when there are or might be distinct signs of the life of the fœtus. Each of these classes is again subdivided into uncomplicated cases and cases complicated by the death of the fœtus, hemorrhage, suppuration, or sepsis.

I. *Before the End of the Fifth Month.*—In *uncomplicated cases* the appendage affected should be removed, and the other set, as well as the uterus, if they are in a healthy condition, should be left alone. The operation is performed exactly like an ordinary ovariotomy or oöphorectomy,[1] but the operator must be prepared for unusual hemorrhage, and great care should be used in handling the sac, as its rupture sometimes has proved fatal.

If, on the other hand, the second set of appendages is diseased or the uterus is the seat of myomatous or cancerous degeneration, the total removal of the uterus with both appendages is said to be indicated. Still, in the author's opinion, cancer is the only disease serious enough to warrant such an addition to the operative interference. The treatment of other ailments should rather be deferred till after recovery from the ectopic gestation. As to the route to be chosen, opinions differ, some preferring vaginal and others abdominal section. In a general way it may be said that until the end of the fourth month, when the pregnant uterus would reach about three fingerbreadths over the symphysis pubis, most modern gynæcologists prefer the vaginal method,[1] but after that time abdominal hysterectomy[2] is the only possible way to do the operation, and even before that time, in an operation in which hemorrhage plays so great a part, in the writer's opinion laparotomy is preferable.

---

[1] Garrigues, Diseases of Women, third ed., pp. 566, 641.

As we have said, if only one side is affected, as a rule, the adnexa of this side should be removed and nothing else; but there may be such extensive adhesions or the hæmostasis may offer such difficulties that it becomes necessary to remove the uterus and both sets of appendages. In general, supravaginal amputation deserves the preference to total extirpation of the uterus,[3] except in cancer cases.

If the fetal sac in ectopic gestation is *intraligamentous* or *subperitoneal*, so that no pedicle can be formed, the best method is first to tie the ovarian vessels in the infundibulopelvic ligament, then the anastomosis of the ovarian, uterine, and funicular arteries,[4] to make a superficial incision through the peritoneal cover in a place where there are no vessels, enucleate the sac from its peritoneal pouch, and treat the cavity left as in other cases of enucleation.[5] Generally, the abdominal wound may be closed and no drainage is needed

In cases of *interstitial pregnancy* Dr. Howard Kelly, of Baltimore, has proposed to dilate the cervix, introduce a uterine sound through it, and perforate the fetal sac. If laparotomy has been performed, the other hand introduced through the wound steadies the sac from without. If the sac in interstitial pregnancy has ruptured and the condition of the patient is fairly good, efforts may be made to clear out the sac and suture it. Active hemorrhage is controlled by ligating the ovarian and uterine arteries of the affected side, or in a more serious case by first throwing a rubber tube around the uterus below the sac.

The *complications* that may influence the treatment in these early cases are hemorrhage, suppuration, or sepsis.

The importance of the hemorrhage depends entirely upon the place in which it takes place and the amount of blood lost. A simple *hæmatosalpinx* may be enucleated and removed with the same facility as a common tube containing a fetal sac. Nay, even the tube has been saved. Both in vaginal and abdominal operations the tube containing the blood has been incised, cleaned, and sewed up again.

---

[1] Garrigues, Diseases of Women, third ed., p. 510.

[2] Ibid., p. 518.

[3] Ibid., p. 525.

[4] Ibid., p. 58.

[5] Ibid., p. 526.

But this seems to be carrying conservative surgery too far, since the patient might again be placed in the same predicament. She may be glad to come out of her present dangerous condition at the cost of a tube which might endanger her life afterwards.

A *hæmatoma* may be treated by simple vaginal incision and removal of what comes off easily.

In *hæmatocele* it is best to give nature plenty of time to form the roof over the blood that separates it from the peritoneal cavity.

The patient should be kept very quiet in bed, an ice-bag should be applied over the symphysis, unless her vitality is low, and pain should be relieved by opiates.

If the tumor does not become absorbed within a month or grows in size, it is best to introduce a posterior vaginal blade, pull the cervix down with a bullet-forceps, make a straight incision in the median line and dilate the wound bluntly; or to make a transverse incision behind the cervix, adding a perpendicular one down from the middle of the first to the bottom of Douglas's pouch, and empty the sac very gently with the finger, a blunt curette, or a common teaspoon.[1]

One should be satisfied when the fœtus and some clots have been removed. Too energetic cleaning might start new hemorrhage. If there is no bleeding a thick soft-rubber tube wound with iodoform gauze is inserted, but if it bleeds some it is safer to tampon for twenty-four hours or more and introduce the tube later, and then pack the vagina loosely. In the beginning the dressing is changed daily and some mild antiseptic solution used for irrigation.

If the extravasation cannot be reached from the vagina, laparotomy should be performed. This may be done in two ways, the *subperitoneal* or the *transperitoneal* method. In the subperitoneal method an incision is made above and parallel to Poupart's ligament, the peritoneum lifted up, and an incision made into the sac without entering the peritoneal cavity. If this is opened accidentally, the opening should be enlarged and tamponed with iodoform gauze for twenty-four hours, until adhesions have formed. Then the gauze is removed and the tumor incised. The cavity once emptied, a counter-opening should be made in the vaginal vault and through-drainage established.

Transperitoneal laparotomy is performed in the median line. If possible, the sac should be stitched to the parietal peritoneum and drained. But if there is no separate sac, or if it is so brittle that the sutures tear out, all we can do is to wash out the cavity with sterilized water or Thiersch's solution and drain with iodoform gauze through the abdominal wall.

---

[1] Garrigues, Diseases of Women, third ed., pp. 510, 690.

When once the vaginal incision is made, the whole pelvis can be palpated, and if the operator so wishes he may remove the appendages on the affected side, leaving the uterus and the other set of appendages; or he may remove all.

Laparotomy is more dangerous, but in cases of repeated bleeding into the sac, that is the operation to be preferred, since it offers much greater facilities for dealing with the source of the hemorrhage.

The worst of abdominal hemorrhages is the non-encysted, cataclysmic, *intraperitoneal hemorrhage*, which may lead to almost instant death. In a case that was operated on ten minutes after a rupture of the Fallopian tube a quart of blood had already accumulated in the peritoneal cavity. In that class of cases the only available remedy is immediate laparotomy. By turning out clots and liquid blood the operator makes his way as rapidly as possible to the internal genitals, where in most cases he will find a ruptured tube, which he removes. After that he cleans the peritoneal cavity, wipes it dry, and closes it in the most expeditious way, which is to insert silkworm-gut sutures through the whole thickness of the abdominal wall, inclusive of the peritoneum. After that every effort should be made to raise the vitality of the patient,[1] and to increase the bulk of blood circulating through her body by subcutaneous or intravenous injection of normal salt solution.

If the contents of the fetal sac *suppurate* or become *septic*, the tumor becomes softer, the temperature rises, the pulse becomes frequent, the skin dry, and the patient complains of pain in the loins and the legs. The sac should be opened by vaginal incision, if it can be reached this way. Otherwise laparotomy with marsupialization or counter-opening in the vagina is indicated.[2]

II. *After the Fifth Month.*—If the patient comes under observation at a time when the child is viable, laparotomy should be performed at once, with the hope of saving both mother and child. As a rule, the fetal sac, after being surrounded by absorbent pads, is simply opened, the child extracted, the edges of the sac stitched to the parietal peritoneum, the placenta left undisturbed until it is loose, which takes from two to four weeks, and the sac filled loosely with iodoform gauze, which is renewed daily, and at the same time the sac is irrigated with sterilized water or some mild antiseptic.

To this general rule there are three exceptions. First, if we have to deal with a tubal or ovarian pregnancy and the sac seems to be removable, it should be taken away. Second, if there is a partial loosening of the placenta, causing uncontrollable hemorrhage, the placenta must be totally removed and hæmostasis sought to be obtained by ligation or circumvention of vessels, the thermocautery, or Mikulicz's tampon.[1] Third, if it is a secondary abdominal pregnancy, when the original sac has ruptured and the fœtus lies free in the abdominal cavity, there is no sac to stitch to the abdominal wall. After extraction of the child, the upper part of the wound should be closed and the placenta covered with strips of iodoform gauze, the ends of which are led out through the lower angle of the wound. The irritation produced by the gauze causes adhesions to form, so that the placenta comes to lie in a sac walled off from the peritoneal cavity but open on the anterior abdominal wall. This packing ought to be left undisturbed as long as the general condition of the patient warrants it. The mummification of the placenta may be furthered by covering it with dry benzoate of sodium.

---

[1] Garrigues, Diseases of Women, third ed., pp. 225, 226.

[2] Ibid., pp. 660, 703.

If the child is not yet viable, our conduct must depend on circumstances. If the patient is in a precarious condition or cannot be watched, it is necessary in her interest to sacrifice the child and perform laparotomy at once. If, on the other hand, she feels well and can be under constant observation, it is humane to give the child a chance. The operation should then be postponed till the seventh, eighth, or ninth month—the longer the better, but should under all circumstances be performed before false labor begins, when the child is particularly liable to succumb and the mother is in the most unfavorable condition. In the mean time she should be kept quiet, pain should be relieved with opium, and the operation postponed unless internal hemorrhage necessitates immediate laparotomy. Before labor sets in the child should be removed, the sac being stitched to the abdominal wall and the placenta left in.

If at this period of gestation the sac ruptures and hemorrhage occurs, be it cataclysmic or slow, laparotomy should be performed at once, the bleeding point secured, and the sac stitched to the abdominal wall. But if the bleeding comes from the placenta, it may be necessary to remove this.

Cases of *suppurative peritonitis* are treated in the same way.

Partial Removal of Sac.—Instead of removing the whole sac or leaving it altogether, as much of it as can be got loose without causing hemorrhage or prolonging the operation unduly may be cut off, and the remainder stitched to the abdominal wall, or folded together over the placenta and closed with sutures after a counter-opening has been made in the vagina.

Dead Child.—If the child is dead, the conduct differs according to the time elapsed since its death. If it died recently, it is best to wait in order to give the placenta as much time as possible to undergo involution. The operation ought, however, to be performed before menstruation returns, at which time the danger of hemorrhage is increased. The longest time allowed should be six weeks. The operation consists in laparotomy and marsupialization.

---

[1] Garrigues, Diseases of Women, third ed., pp. 186, 526.

If the child has long been dead, the same operation should be performed at once.

Old Cysts.—Old cysts containing a fœtus should, if possible, be extirpated. If not, we must be satisfied with marsupialization.

In these old sacs the remains of the fœtus are sometimes so adherent that they cannot be removed without injury to viscera. Then they should be left and the sac drained and irrigated until the fetal parts become loosened.

Suppurating Sacs with Fistulous Tracts.—If a suppurating cyst has opened through the abdominal wall or the vagina, the opening may be enlarged with the knife and blunt dilatation. If the abscess communicates with the rectum, it is best to make a counter-opening through the abdominal wall or the vagina. If it opens into the bladder, a small fœtus may be removed through the dilated urethra; for the removal of a larger, an incision is made from the vagina,—artificial vesicovaginal fistula,—or suprapubic cystotomy, and perhaps even laparotomy, may become necessary.

Repeated Pregnancy.—An ectopic gestation may be followed by another ectopic gestation or by normal pregnancy. This fact has a bearing on the treatment in several ways. It teaches us not to commit unnecessary mutilations which would render future impregnation impossible. On the other hand, it is an incentive to operate on old cases, even when they are in a dormant condition, as old cysts are liable to suppurate when a new pregnancy supervenes.

CHAPTER VII.

SYSTEMIC DISTURBANCES DUE TO PREGNANCY.

§ 1. **Hyperemesis, Severe or Uncontrollable Vomiting.**—As we know, some degree of vomiting is so common in pregnant women that it is even counted among the signs of pregnancy. This physiological vomiting is not severe, stops usually about the middle of gestation, and does not affect the general health. The patient retains her appetite and does not lose in weight. The pathological vomiting is a very different matter. It often does not begin before the second half of pregnancy; it may take such proportions that the woman cannot retain a particle of food; and since the food that should sustain her body is ejected, nutrition suffers, she grows thin and loses her strength.

The pulse becomes weak and œdema may appear, especially around the ankles. Her mental force diminishes and she becomes despondent. The amount of urine secreted in twenty-four hours is reduced. Finally, she may die of inanition.

Etiology.—Sometimes a displacement of the uterus—either anteflexion or retroflexion—or an over-distention, as we find it in hydramnion or twin pregnancy, may be the cause. In other cases there may be present a disease of the stomach, such as ulcer or cancer, which under the influence of pregnancy takes a new development. But most commonly no such material changes can be found, and then the disturbance is looked upon as a reflex neurosis due to the growth of the uterus and pressure on nerves in its wall or in its surroundings.

Prognosis.—Most cases are quite amenable to treatment and of short duration; but others constitute a complication that threatens the patient's life, resists all medical treatment, and calls for the artificial interruption of pregnancy as the only means of saving the woman.

Treatment.—If there is a displacement of the womb, it should as far as possible be corrected. A retroflexed uterus may be replaced and kept in place with a pessary. If the anteflexion passes normal limits, the patient should be kept in the dorsal position. A gentle pressure may be exercised for an hour once or twice a day, either with the patient's own hand or with a towel rolled into a cylinder; or a Gariel's air pessary may be inflated in the vagina. Diseases of the stomach should be treated according to the rules of medical practice. If there are granulations at the os, they should be touched with lunar caustic in substance or in a strong solution (1 to 8 or 10). Sometimes immediate relief has been obtained by Copeland's method, which consists in the dilatation of the os and the lower part of the cervical canal by means of the index-finger of one hand while counter-pressure is made on the fundus with the other. The irrigation of the stomach has also arrested vomiting as by magic, and the application of an ice-bag to the neck has given good results. Likewise electricity, either the faradic or the galvanic current. One pole is applied to the course of the pneumogastric nerve on the side of the neck, and the other to the pit of the stomach. The application should be made daily for five minutes. Since the disease is most commonly of nervous origin, hypnotism may, perhaps, gain an easy victory.

In common cases I prescribe first bismuth:

℞ Bismuthi subnitrat., ʒii (8 grammes);
Magnesiæ carbonat.,
Sacchari albi, āā ℥ss (15 grammes).—M.
Sig.—A rounded teaspoonful in water three times a day.

If that does not help, I use iodine:

℞ Tinct. iodi, fl ʒ ss (2 grammes);
Potass. iodidi, ʒ ss (2 grammes;
Aquæ dest., ℥ iv (120 grammes).—M.
Sig.—A teaspoonful every two hours mixed with a tablespoonful of water.

Often cocaine (¼ grain—15 milligrammes—every hour) has an excellent effect.

Sometimes hydrocyanic acid in the following mixture is good.

℞ Ac. hydrocyan. dilut., ʒ ss (2 grammes);
Ac. citrici,
Sodii bicarbonat., āā ʒ ii (8 grammes);
Syrup. rubi idæi, ℥ ss (15 grammes);
Aquæ dest., q. s. ad ℥ vi (180 grammes).—M.
Sig.—A tablespoonful every two hours.

Then oxalate of cerium (gr. v—30 centigrammes—in a capsule t. i. d.), orexine (gr. ii–iv—from 12 to 25 centigrammes—t. i. d.), bromide of potassium or sodium (gr. xv—1 gramme—t. i. d.), creosote (♏ i–iii—from 6 to 20 centigrammes—in a teaspoonful of glycerin), salicin (gr. v—30 centigrammes—t. i. d. in a capsule), ethereal tincture of opium (tinct. opii deodorata, ♏ xv—1 gramme—t. i. d.), phosphorus, asafœtida, valerian, or liquor arsenicalis Fowleri (♏ i—6 centigrammes—every three hours), vinum ipecacuanhæ (♏ i—6 centigrammes—every hour), may be tried.

It is needless to say that the bowels should be moved if they are constipated, and some judgment should be used in the choice of an aperient. Nauseous oil or salts are out of the question. A pill, as a rule, is preferable on account of its small bulk; or some of the made-up medicines, such as Tarrant's Seltzer Aperient, Abbey's Salt, Red Raven Split, or solution of magnesium citrate, which have been made palatable by the pharmacist's art, should be tried.

The diet is of great importance, and the physician should sedulously consult the patient's likes and dislikes. As a rule, ice-cold milk is borne better than anything else, but sometimes it must be peptonized "by the cold process," dissolving the contents of one of Fairchild's peptonizing powder tubes in a pint of fresh milk. Some can take koumyss or zoolac, products produced by the fermentation of milk. Sometimes a small quantity of meat with bread and butter—for instance, a delicate ox-tongue or ham sandwich—is grateful to the patient and is retained. As to drinks, nothing can be equal to sips of iced champagne, and, when that cannot be procured, other alcoholic drinks, especially light iced wine mixed with seltzer-water, often settle the rebellious stomach. It is also well to let the patient swallow small lumps of ice, and sometimes an ice-bag or, on the contrary, a hot-water bag, or a compress saturated with hot alcohol, mustard, or spirit of camphor, applied to the pit of the stomach, proves useful.

The different invalid-foods, such as Carnrick's Soluble Food, Horlick's Malted Milk, Nestlé's Food, or Tropon, may be tried. The simultaneous administration of digestives, such as pepsin, pancreatin, ingluvin, or diastase, may help the retention and assimilation of food. If the stomach continues to be rebellious, it may be allowed to rest for weeks by resorting to rectal alimentation.[1] But in serious cases the patient must be watched most carefully, and if in spite of all our efforts she continues to lose ground, the only way of saving her life is to induce premature labor or even artificial abortion.

§ 2. **Ptyalism.**—The secretion of the salivary glands may increase during pregnancy to such an extent as to be not only highly uncomfortable, but even dangerous. A quart or more has been known to be gathered in twenty-four hours, the patient cannot do anything but spit, her mouth becomes sore, and her nutrition suffers under the loss of the albuminoid fluid. These extreme cases are, however, rare.

Treatment.—Astringents have no effect; but nervines, such as bromide of potassium, belladonna, cocaine, and opium, have a restricting power. A derivation to the kidneys by the administration of juniper tea (berries ℥i, boiling water Oi; dose ℥ss–ii two or three times a day) has also effected a cure.

§ 3. **Constipation or diarrhœa** occurs quite commonly in pregnancy and should be treated medicinally and dietetically according to general rules.

§ 4. **Toothache and Caries of the Teeth.**—Besides the common toothache of a purely neuralgic character, caries is apt to set in or get worse during pregnancy.

§ 5. **Cough.**—Some women suffer considerably from a nervous cough during pregnancy, which should not be neglected, since cough predisposes to miscarriage. It is treated with opium, belladonna, bromide of potassium, hydrocyanic acid or heroine (tablets with gr. $\frac{1}{24}$, $\frac{1}{12}$, $\frac{1}{6}$—2.5, 5, 10 milligrammes).

§ 6. **Dyspnœa.**—In the earlier months of pregnancy difficulty in breathing is of nervous origin. Later it is due to mechanical pressure of the growing uterus. The patient should be much in the open air. The nervous form may be benefited by the same drugs as nervous cough is. In the mechanical form a chief point is the avoidance of all constricting bands and stiff corsets. Sometimes iron and manganese, by enriching the blood, indirectly relieve the shortness of breath.

§ 7. **Palpitation** may be a consequence of the hydræmic condition characteristic of pregnancy or may be a reflex neurosis. In the former case it should be treated with chalybeates, manganese, or extract of red bone marrow. In the latter monobromide of camphor (gr. iv—25 centigrammes—t. i. d. in capsules) is the best remedy.

---

[1] Garrigues, Diseases of Women, third ed., p. 241.

§ 8. **Lipothymia.**—Some women are apt to have fainting-spells, which may be repeated several times a day. Consciousness is lost, but respiration and pulsation continue. During an attack all restricting bands should be loosened; the patient should be aroused by sprinkling ice-water upon her face, slapping her naked chest with a towel dipped in the same, holding strong spirit of ammonia or carbonate of ammonium under her nose, applying hot-water bottles and massage to the extremities. In the intervals a fortifying diet and tonics are indicated.

§ 9. **Insomnia.**—Pregnant women often complain of lying awake or being annoyed by dreams, which disturbance of sleep may weaken them. In order to combat it, they should avoid excitement in the evening hours, go early to bed, have their sleeping-room well ventilated, and be properly covered. Among dietetic means, I have seen good effect of a pint of lager beer taken towards bedtime. If that does not suffice, recourse must be had to some of the hypnotics, especially trional (gr. xv—1 gramme), chloralamid (gr. xxx–xlv—from 2 to 3 grammes), sulphonal (gr. x—60 centigrammes—repeated every half hour, from 2 to 4 times), chloral hydrate (gr. xv—1 gramme—repeated every half hour, from 2 to 4 times), or a tablet with hydrobromate of hyoscine (gr. $\frac{1}{60}$—1 milligramme—by the mouth or gr. $\frac{1}{100}$—0.6 milligramme—hypodermically).

§ 10. **Headache.**—Headache often troubles the pregnant. Often it is due to anæmia, but more commonly it is of purely neuralgic nature. First of all, attention should be paid to the bowels, insuring a good daily movement. The anæmia should be combated with Blaud's pills, to which, if the patient is constipated, aloes may be added. Extract of red bone marrow or hemaboloids have even a better effect. Symptomatically I use:

℞ Phenacetini, ʒi (4 grammes);
Sodii bromidi, ʒii (8 grammes);
Caffeinæ, gr. xxiv (1.5 grammes).
M. et div. in chart. cerat. no. xii.
Sig.—One powder, repeated after one and three hours if necessary.

§ 11. **Neuralgia.**—Besides the neuralgias already named, such as toothache and headache, the patient may suffer from pain in the breasts, in the intercostal spaces, especially the fifth on the left side, in the groins, shooting down along the front of the thighs, and in the uterus itself. Internally bromide of potassium or sodium, a chalybeate, arsenic, or quinine is useful in quieting the irritated nerves and combating anæmia or malaria. Exceptionally a hypodermic injection of morphine may be necessary. Externally a mustard plaster or friction with—

℞ Chloroformi, ℥ss (15 grammes);
Spts. ammoniæ, ʒii (8 grammes);
Spts. camphoræ, q. s. ad ℥ii (60 grammes),

often gives relief.

§ 12. **Chorea.**—Chorea is especially apt to appear during the pregnancy of women who have suffered from the disease in childhood. Rheumatism predisposes to it, and therefore it is often found in persons suffering from valvular lesions of the heart. In some patients the disease has a mild type; in others it interferes with such indispensable movements as chewing and deglutition and prevents sleep, when the whole nutrition suffers to such an extent that a fatal end may be predicted if pregnancy is allowed to go on, or that insanity may follow after delivery. Sometimes nature herself applies the supreme remedy, the disease ending in abortion, but in others it may go on till term. In both cases, as a rule, it ends shortly after the uterus has been emptied, which plainly shows that it is a reflex neurosis brought on by the irritation of the nerves of the uterus. But not infrequently it returns in subsequent pregnancies.

Treatment.—If the disease develops in a rheumatic individual, warm baths, alkalines, and iodides should form an important part of the treatment. The patient should sleep in a blanket without sheets, and the diet should contain but little meat and no tea, coffee, chocolate, or alcoholic beverages. If, on the other hand, it takes its origin in an anæmic person, albuminoid food and a generous wine, together with iron, manganese, red bone marrow, and arsenic, are indicated. Symptomatically relief is afforded by the bromides, belladonna, Calabar bean (gr. ii–iii—from 12 to 20 centigrammes—or tinctura physostigmatis, ♏x—60 centigrammes—t. i. d.), chloroform, chloral, or morphine. Chloral has been given in doses of from gr. xv to gr. xxx— —from 1 to 2 grammes—repeated every 2 to 4 hours, so as to induce a continuous sleep, from which the patient, however, can be aroused when loudly spoken to, and which is only interrupted in order to give fluid nourishment five or six times a day and attend to evacuations.[1]

If nothing else helps, premature labor or even abortion should be induced.

§ 13. **Tetany**[2] is a disease of the nervous system that sometimes affects pregnant and puerperal women. Trousseau distinguishes three forms,—a benign, a middling, and a grave one. In the benign form there are only local manifestations, a tingling sensation in hands and feet, stiffness, and pains. The hand commonly assumes the coniform shape used when the accoucheur wants to pass it through the vagina; but sometimes the fingers become so bent that the nails leave impressions on the skin. The hand is bent on the forearm, and this on the arm. The feet are in strong plantar flexion with bent toes and drawn-up heels, while the legs and thighs are extended. The contraction may simultaneously occupy the upper and lower extremities, or alternate between the two, or be limited to either of them. Most commonly the hands are affected. The convulsed muscles offer resistance when one tries to change the position of the parts; and if he succeeds, the fingers, when let loose, resume their flexure, or exceptionally they remain extended, although the muscles continue to be contracted. The muscles are hard to the touch. An attack may last from five minutes to two hours. Towards the end the tingling sensation returns, and thereafter the muscles again become movable until a new attack occurs. The whole disease lasts several days or as much as three months. At any time during its course contractions can be brought on in an extremity by compressing its chief artery, vein, or nerve. There is some perversion of the sense of touch. An object held in the closed hand feels as if it were wrapped up in a cloth. When walking with naked feet on the floor, the patient has a sensation as if she walked on a carpet. In the second degree the patient feels more pain and has fever. Different parts of the body become congested and the extremities are œdematous. The muscular contractions extend to the trunk and face. Trismus and difficult deglutition appear. The third degree is distinguished only by the prolongation and frequency of the attacks.

---

[1] Louis Lichtschein, Medical Record, April 1, 1899.

[2] Garrigues, "Obstetrical Tetanus and Tetanoid Contractions," Amer. Jour. Obst., vol. xv., No. 4, October, 1882.

The *prognosis* is good, recovery following promptly after the birth of the child.

The *treatment* consists in tonics and antispasmodics.

§ 14. **Tetanus.**—Tetanus is much more dangerous than tetany. During pregnancy it appears sometimes with an intermittent type and starting from the extremities, like tetany, but it leads to general convulsions and death. It is much more frequent after delivery, wherefore we will postpone the consideration of it.

§ 15. **Paralysis.**—Different forms of paralysis of motor or sensory nerves appear so much oftener in pregnant women than in other women of their age, that the conclusion is warranted that pregnancy in itself predisposes to paralysis, which is corroborated by the restitution to health which commonly follows some time after labor. The most common form of paralysis is hemiplegia. Much less frequent is paraplegia, and still rarer is facial paralysis, amaurosis, or deafness. The affection begins, as a rule, in the later months of pregnancy.

Etiology.—In the vast majority of cases the paralysis is combined with albuminuria, and is therefore looked upon as due to uræmia. In others it is attributed to anæmia, plethora, cerebral hemorrhage or congestion of the brain, hysteria, rheumatism, and heart diseases with concomitant embolus.

Prognosis.—Compared with paralysis under other conditions, the prognosis is favorable. If it is only of reflex origin, as a rule, it ceases after abortion or labor at term; but if pregnancy occurs when there is an organic disease of the nerve centres, this usually gets worse during pregnancy, and may even end fatally.

Treatment.—If paralysis occurs in a person affected with albuminuria, the case is so grave that premature labor or even abortion should be induced at once. If on the other hand there is no albumin in the urine, pregnancy may be allowed to go on till term or at least till the child is in a good condition for induction of premature labor, but both mother and child should be carefully watched. This is especially necessary in cases of paraplegia, for when the seat of the affection of the spine is above the centre of uterine contraction, labor is painless, and may take place without the patient knowing it, whereby both she and the child are exposed to considerable danger, which even has proved fatal.

Anæmia should be combated with chalybeates, manganese, red bone marrow, and arsenic. Strychnine is contraindicated during pregnancy on account of its oxytocic effect; but after delivery it forms the chief remedy together with electricity.

§ 16. **Convulsions.**—Persons suffering from *epilepsy*, as a rule, are no worse during pregnancy or childbirth. Often they are even better. They should, however, not be allowed to nurse, as this weakens them, and thus may aggravate the disease, and as an inherited predisposition in the child might be increased thereby. During an attack the child might also be injured. The usual treatment with large doses of bromides is well borne.

Hysterical convulsions as well as other forms of hysteria may be observed in pregnant women. If they have been hysterical before impregnation, occasionally the disease ceases, but much more frequently their hysteria continues and is aggravated during pregnancy. The disease may also take its first beginning during pregnancy or a painful labor. Hysterical pregnant women have a predisposition to become insane after confinement. The treatment does not offer any serious deviation from that outside of pregnancy, except that strychnine is contraindicated. The bromides have an excellent effect.

By far the most common form of convulsions connected with pregnancy, labor, and the puerperium is *eclampsia.*

Eclampsia is like epilepsy in appearance, but differs from it by the rapid succession of the attacks and by the immediate danger to life it entails.

It is not a very rare disease, since it is found once in 330 cases of labor, and on account of the horrible spectacle it offers and the well-known dangers linked with it, those who are connected with lying-in institutions or make a specialty of obstetric practice have occasion to witness it much more frequently. It occurs most frequently during labor, but is not rare during pregnancy, and may even make its first appearance after delivery, but then, as a rule, during the first few days, and quite exceptionally several weeks later.

Symptoms.—In picturing this formidable disease, we shall consider separately the premonitory period, the attacks, and the intervals between the attacks.

The premonitory stage may be absent altogether, so that the convulsions break out without any warning in an apparently well woman; but in patients who are under constant supervision there are certain well-known symptoms which call attention to the threatening storm. The patient complains of headache, pain in the pit of the stomach (cardialgia), blurred vision, particularly noticeable in reading fine type or in sewing, black spots flitting before the eyes, and dizziness.

There is usually some œdema of the subcutaneous tissue. That of the lower limbs and vulva has comparatively little importance, since it may be produced by simple mechanical pressure on the veins in the pelvis; that of the hands and fingers, necessitating the removal of rings which before pregnancy were wide enough, is more suspicious, and an apparent broadening and flattening of the face, due to infiltration of the loose connective tissue surrounding the eyes, is still more significant.

The urine in nearly all cases contains a more or less considerable amount of albumin, sometimes so much that the whole mass solidifies by boiling. Its secretion is also much reduced, and its color is high.

Sometimes nausea and vomiting—although they have not been present during the first half of the pregnancy, when usually they are most common—appear. The patient may complain of restlessness and insomnia, and her friends may note in her an irritability of temper unknown before.

The attack proper comes on suddenly, the first thing noticed being little twitchings of the eyelids, followed by tonic and clonic spasms, extending over the whole face, the neck, the trunk, and the extremities. The contraction of the dorsal muscles predominating, opisthotonus is developed, while the arms and legs are being alternately flexed and extended in rapid succession, and the thumbs buried in the clinched fists. Even the musculature of the uterus partakes in the general convulsions, in consequence of which the labor proceeds with unusual rapidity. The face, at first pale, soon becomes purple or violet and bloated. The pupils are dilated and the eyes turned up, so as to expose only the white. The respiration is temporarily arrested. Often the urine and fæces are expelled involuntarily. The tongue is protruded, and, if not protected, apt to be bitten, or it may fall back and choke the patient. The mouth is full of foam, and when air enters the lungs it produces the râles of pulmonary œdema. Finally, the patient may die suffocated or in collapse during an attack or in consequence of cerebral hemorrhage. Such attacks last one or two minutes, which time, however, on account of the horror of the situation, seems much longer. They are, as a rule, repeated from a few times up to a hundred.

After the spasms have passed the patient lies in a comatose condition, with stertorous respiration and groans. The cyanosis vanishes gradually, respiration becomes regular, free perspiration breaks out, and after a shorter or longer lapse of time the patient awakes, feels tired, complains of pain in the muscles, and has no recollection whatever of what she has gone through. In the beginning there may be hours between the attacks and complete return to consciousness in the intervals, but the oftener the convulsions are repeated the shorter become the interspaces, and soon the patient remains in coma all the time between the spasms.

As a rule, convulsions and coma cease with the completion of labor, but they may exceptionally continue for days, and the patient may die after being delivered, death being due to insufficient urinary secretion, to exhaustion of nerve force, to pulmonary œdema, or to pneumonia, the last of which may be brought about by the entrance of substances from the alimentary canal into the lungs (deglutition pneumonia). Frequently the death of the fœtus puts an end to the attacks.

The pulse ordinarily becomes rapid—up to 150 beats per minute—hard and full. If it becomes weak and easily compressible, the prognosis is absolutely bad.

The temperature rises with the frequency and duration of the attacks, and either attains a great height before death or subsides rather rapidly after the cessation of the convulsions.

After the convulsions have ceased, unconsciousness and somnolence generally continue. The patient is restless and sensitive to touch. This condition may continue for several days.

Not infrequently eclampsia is followed by attacks of mania, which, however, as a rule, are not of long duration and end in recovery.

Pathology.—Autopsies on patients who have succumbed to eclampsia show conditions so various that they do not teach us much in regard to the true nature of the disease, and often it remains doubtful whether the changes found should be looked upon as cause or effect of the disease. The brain is usually anæmic and œdematous, and sometimes there is an extravasation of blood into the ventricles or at the base. Very frequently the kidneys are in a state of congestion or of acute or chronic nephritis. Often the ureters are dilated. But in other cases no trace of abnormalities is found in the uropoietic organs, while in the liver are found hemorrhagic foci. Liver cells, parts of the syncytium of the villi of the chorion, and endothelial cells of the blood-vessels have been found forming minute emboli far away from the place in which they originated. Sometimes the muscular tissue of the heart is found degenerated. The lungs are œdematous or inflamed. Not rarely the pelvis is generally contracted.

Etiology.—Many theories have been advanced to explain the outbreak of eclampsia, but so far none of them covers all cases. There are, however, facts which doubtless are of great importance in the production of this terrible malady. The disease is much more common in primiparæ than in those who have borne children before. It occurs preferably in the last months of pregnancy or during labor. Twin pregnancy predisposes to it. As a rule, it ceases after delivery. Frequently the ureters have been found dilated. Taking all these facts together, the theory has been advanced that the convulsions are due to *pressure on the ureters*, a theory that covers many cases, but not those where the disease breaks out during the puerperium, when all pressure is removed, and which is weakened by the fact that ovarian and uterine tumors much larger than the pregnant uterus do not give rise to eclampsia.

The almost constant occurrence of albuminuria, the diminution in renal secretion, the frequent presence of *nephritis*, and the greatly increased amount of leucomaines found in the blood of those affected with eclampsia have led many to look upon the convulsions as caused by retention of some substance that ordinarily is eliminated with the urine and which has poisonous qualities.

A third theory seeks the cause in the *anæmic condition of the brain*, which has been proved experimentally to give rise to convulsions in animals. Some think this ischæmia is caused by the *hydræmia* characteristic of pregnancy and the opposition to free circulation offered by the diseased kidneys, while others invoke a *spastic contraction of the blood-vessels* of both brain and kidney.

Some think the *liver* is the organ at fault.

The increased *nervous irritability* so conspicuous during pregnancy has without doubt much to do with the production of the disease and may combine with pressure, toxæmia, or anæmia to produce the convulsions.

In some instances *heredity* seems to predispose to the disease, several members of the same family falling victims to it.

Atmospheric conditions are probably not without influence on the production of eclampsia, many more cases occurring in damp, cold weather than under more favorable circumstances. The social position and the constitution of the patient, on the other hand, seem to be without importance. Rich and poor, strong and weak, well-nourished and half-starving women are equally attacked by this dangerous foe, who respects the palace as little as the hovel.

Of late the theory has been advanced that the disease is of *microbic* origin.

Diagnosis.—The diagnosis of eclampsia hardly offers any difficulty. *Hysteria*, as a rule, is known to have existed before the patient became pregnant. The unconsciousness is not so deep and protracted. The attacks do not follow upon one another with such rapidity. After the attack is over, the patient soon rallies, and a laughing or crying spell offers a picture entirely different from eclampsia. With very rare exceptions *epilepsy* is known to have been present before the present outbreak, and the convulsions are not repeated with such short intervals.

Prognosis.—The prognosis is very grave. The maternal mortality is at least 14 per cent., and the infantile twice as great. It is by no means rare for the accoucheur to be placed in the unenviable position of losing both the beings whose welfare is entrusted to his care. Even after the attacks have discontinued the patient may succumb. There is also danger of apoplexy leaving her an invalid. Eclampsia is often accompanied by hemorrhage from the genital canal. It predisposes to puerperal insanity, and sometimes it is followed by Bright's disease. Not infrequently the albuminuria leads to abortion. The death of the fœtus is probably due to insufficient supply of oxygen or to toxic substances transferred to it from the mother. Sometimes it partakes in the maternal convulsions. Finally, the mother being in so great a danger, the fœtus is apt to suffer under the treatment carried out for the benefit of the mother, whether surgical or medicinal.

Treatment.—The appearance of any of the above-mentioned premonitory signs—headache, dizziness, indistinct vision, pain in the pit of the stomach, restlessness, insomnia, etc.—should put the accoucheur on his guard. I examine the urine even of apparently healthy women once a month during pregnancy. The urine should preferably be drawn, so as to avoid admixture with vaginal and uterine secretions. Traces of albumin are not rarely found in the renal secretion of healthy puerperæ, but the appearance of this substance is so ominous that the urine should thereafter be examined much more frequently. If it contains red blood-corpuscles, epithelial cells from the kidneys, or casts. the condition is so much the more serious, and a large amount of albumin always calls for active interference.

The treatment during the premonitory period is very effective. The writer has seen many cases in which he thinks future evil was averted by timely medication. If the case is at all serious, I put the patient on exclusive milk diet, allowing only a few of the lightest crackers—" sea foam "—to be taken with the milk. If the patient feels perfectly well, I consult her hunger and allow her after having disposed of two quarts of milk per day to eat some meat and a little bread. I let the patient take a warm bath every or every other day, and let her make cold applications to the top of the head and the forehead. If necessary a copious movement of the bowels is brought on once or twice a day by a saline aperient. Twenty drops of tinctura ferri chloridi are given in a mixture four times a day, and every night the patient receives a small dose of chloral hydrate (gr. xv—1 gramme), which seems to have a direct influence in diminishing the amount of albumin in the urine, quiets the nervous system, and induces sleep. If she complains of headache, I give her my headache powders (p. 322). If the urinary secretion—or, what is still more important, the amount of urea—is abnormally small, I prescribe—

℞ Decocti tritici (℥ss), ℥viii (240 grammes) ;
Potassii acetatis,
Potassii bitartratis,
Potassii citratis, āā ʒii (8 grammes).—M.
Sig.—Shake well. A tablespoonful from 4 to 6 times a day.

This acts both as a diuretic and a laxative. Instead of the warm bath, some prefer a vapor bath or a Turkish bath. Tincture of digitalis is also much used as a diuretic.

I am rather reluctant to cause abortion or induce premature labor. In my opinion these should not be resorted to unless there is evidence that the patient's life is endangered, especially if the urine is loaded with albumin, if there is severe headache, disturbed vision, or dizziness, and if milder remedies remain ineffectual.

If we see the patient first during the attack, we give chloroform in order to cut it short and gain some time. But this is a remedy of which it is not well to make a protracted use, since it is apt to cause an acute fatty degeneration of the heart, to which the patient may succumb after having recovered from her eclampsia, and we have other and better means of quieting her nervous system.

The next question to decide is, whether we should bleed the patient or not, and in determining it the accoucheur should be guided not by any doubtful theory as to the nature of the disease, but exclusively by the condition and constitution of the patient. If she is robust, well-nourished, and has a full, hard pulse, he should bear in mind that the subtraction of from twelve to sixteen ounces of blood from a vein at the bend of the elbow has proved decidedly useful in such cases. If, on the other hand, the subject is one of those thin, pale, weak women who form the majority of the female population of our large cities, bleeding is contraindicated.

The next step is to influence the nervous system in a more permanent way than by the evanescent sleep produced by chloroform. For this purpose three drugs vie with one another,—chloral, morphine, and American hellebore—veratrum viride. Chloral hydrate may be given in enemas, gr. xv to xxx (1–2 grammes), repeated every quarter of an hour, until ʒiiss (10 grammes) have been used in all. Morphine may be given hypodermically, beginning with 1½ grain in one dose (*sic*), repeated if after some hours a new attack follows.[1] There is in this disease, as often observed, a tolerance of opium which allows us to use toxic doses.

Tinctura veratri viridis (Norwood) is also used in heroic doses and may also be administered hypodermically, beginning with ♏x and repeating it every quarter of an hour, half hour, or full hour until the pulse is soft and below 60, and thereafter enough to hold it between 60 and 70 per minute. Veratrum viride reduces pulse and temperature, causes diaphoresis and diuresis, and relaxes the cervical canal. It is perhaps even more popular in America than the morphine treatment.

The tongue should be protected against injury by placing a flat wooden stick wound with flannel between the teeth and above the tongue.

Diuresis may be furthered by the subcutaneous injection of normal salt solution,[2] which at the same time serves to dilute the poison circulating in the blood, and, if venesection is used or spontaneous hemorrhage occurs, offers the advantage of increasing the bulk of the circulating fluid.

If there is much anasarca, the wet pack is very useful and may be combined with the above-described medicinal treatment. In order to avoid suffocation of the child in case it should be born while the patient is in the pack, three separate blankets should be used. They are wrung out of water the temperature of which may be adapted to that of the patient, using it cool (80° F.) if her temperature is high and warm (from 100° to 105° F.) if the sole object is to produce perspiration. First a water-proof sheet is laid on the bed, then a dry woollen blanket, then the three wet blankets, one of which surrounds the body from the neck to the genitals, and one each of the extremities. Finally, the dry blanket is wrapped around the body, leaving the space between the legs free. As this treatment is rather weakening, it should not be used longer than two hours at a time, but it may be repeated if necessary.

---

[1] This is a specifically American method, invented by Dr. C. C. P. Clark, of Oswego, N. Y. (see *American Journal of Obstetrics*, 1880, vol. xiii. p. 533, and 1881, vol. xix. p. 416), which of late has been adopted with great success in Germany, without giving credit to its originator.

[2] Garrigues, Diseases of Women, third ed., p. 225.

If oxygen is available, it is well to let the patient inhale it. In cases of pulmonary œdema, the lungs may be freed by dry-cupping of the chest and back. When the patient is unconscious and unable to swallow, she may be purged by mixing a drop of croton oil with a little butter and rubbing it on the tongue.

A question of paramount importance is whether and when labor should be induced. Some authors, wanting the uterus emptied as soon as possible, dilate the cervix forcibly and make deep incisions in it in order to be able to extract the child manually or with the forceps. The writer, on the contrary, sides with those who wait till there is beginning labor, but then he anæsthetizes the patient and dilates the cervical canal with Barnes's bags or with the fingers according to Harris's method. (See OPERATIONS.) When the cervix is obliterated and the os fully dilated, the child is removed by means of forceps or version, operations which will be described later.

In cases where the cervix was not dilatable and the condition of the mother was desperate, Cæsarean section has been performed, saving one-half of the mothers and somewhat less than half of the children.

The above pages had been written when Prof. W. Stroganoff, of St. Petersburg, published his wonderful report of fifty-eight cases of eclampsia without a death.[1] Prof. Stroganoff considers eclampsia to be an acute infectious disease, which usually runs its course in a few hours, seldom exceeding twenty-four, and still more infrequently exceeding forty-eight hours in duration. He takes chloroform inhalation during the attacks to be injurious on account of its effect on the respiration. During the attack he lets the patient inhale oxygen and removes all weight from the thorax. After the first convulsion he injects ¼ grain (15 milligrammes) of hydrochlorate of morphine. This is repeated in an hour, or, if the patient is unruly and has muscular twitching, earlier. After the second or, in bad cases, the third injection, chloral hydrate, gr. xx–xl (from 1.30 to 2.60 grammes), is given by the mouth or by the rectum every six to ten hours, so as to keep up a light narcosis. If a convulsion threatens, morphine is injected hypodermically. Stroganoff claims that the combination of morphine and chloral is more effective than either of these drugs employed alone.

As soon as the uterus can be emptied without doing harm it ought to be done, and the method he prefers for obtaining dilatation is by

---

[1] Stroganoff, Obstetrics, vol. iii., No. 2, Feb., 1901, p. 49.

Champetier des Ribes's bag with continuous traction. He condemns hot baths and packs and never uses venesection. Besides the morphine and chloral he uses only sodium bromide. Mucus is removed from mouth and nostrils, the room well ventilated, and all irritation avoided. If a vaginal examination has to be made or the urine must be drawn or the genital canal cleaned, the patient is first anæsthetized with chloroform. If there is any weakness of the heart, musk or sulphuric ether is given.

The treatment has also a good effect on the fœtus, since Stroganoff had an infantile mortality of only 11 per cent., which is about one-fourth of the combined statistics of German obstetricians.

In a later article[1] Stroganoff has increased his material to one hundred and thirteen cases with six deaths, due to croupous pneumonia, puerperal sepsis, or the moribund condition in which the patients were received.

If convulsions continue after the uterus is empty, the above-described treatment is continued, and at this stage Zweifel[2] extols the effect of bleeding.

§ 17. **Insanity.**—Mental disease is much more common after than before delivery, and will be described among the affections of the puerperium. But even during pregnancy the mind sometimes becomes unbalanced. The tendency to fear and sadness which we have spoken of as a not infrequent accompaniment of the pregnant condition may degenerate into real melancholia, perverse ideas, hallucinations, change of character, and proneness to suicide. The patient sometimes refers to some imaginary great sin she has committed, indulges in lewd language, or makes improper proposals to persons of the male sex. Sometimes she develops kleptomania or dipsomania.

Insanity of pregnancy is much more common among women between thirty and forty years of age than among younger women, and occurs more frequently in primiparæ than in those who have borne children. Often an hereditary disposition is undeniable, the same condition having appeared in several members of one family; or other neuroses, such as epilepsy, hysteria, and drunkenness, being found in the history of the ancestors of the patient. In some women insanity has recurred in each succeeding pregnancy.

The disease commonly starts in the third or fourth month and rarely ceases before the end of gestation.

Taking into consideration the interests of mother, child, and the community at large, it should not be allowed to develop further, but forthwith terminated by the induction of artificial abortion.

---

[1] Stroganoff, Centralblatt für Gynäkologie, 1901, vol. xxv., No. 48, p. 1312.

[2] Paul Zweifel, Lehrbuch der Geburtshülfe, fourth ed., Stuttgart, 1895, p. 433.

§ 18. **Irritability of the Bladder.**—Very commonly pregnant women complain of a frequent desire to urinate. In the beginning this is due to a reflex neurosis; but later, when the uterus grows, it is largely caused by the mechanical pressure. The discomfort may become so great that it makes the patient nervous and sleepless, with impairment of the general health.

The patient should rest for an hour or more in the recumbent position in the middle of the day. She should avoid alcoholic beverages, especially beer. Alkalines and narcotics should be prescribed,—*e. g.:*

℞ Tinct. belladonnæ, ʒii (8 grammes);
Liq. potassæ, ℥i (30 grammes);
Aquæ dest., q. s. ad ℥iv (120 grammes).—M.
Sig.—A teaspoonful in a wineglassful of water three times a day, between meals.

Or, if the urine is alkaline, a tablespoonful of the saturated solution of boric acid should be taken three or four times a day. Suppositories containing one-third of a grain of morphine may be placed in the vagina at bedtime.

§ 19. **Enuresis.**—Some pregnant women cannot retain the urine, which constantly dribbles away, irritating the skin. An abdominal supporter often gives great relief. Of remedies commonly prescribed for the weakness, strychnine and ergot are contraindicated. If needed the chemical reaction should be changed by means of alkalines or boric, phosphoric, or nitric acid. Belladonna, small doses of tincture of cantharides, turpentine, rhus aromatica, scutellaria, and bromide of potassium quiet the bladder, and iron preparations may strengthen it.

§ 20. **Retention of urine** is due to pressure against the urethra. As we have seen above, it is often a symptom of a retroflexed uterus, and may have very serious consequences. The bladder should therefore in time be emptied with a catheter, a retroflexed uterus must be replaced and kept in place with a pessary and an abdominal supporter, and rest in the recumbent position may also be useful.

§ 21. **The Kidney of Pregnancy and Nephritis.**—The examination of the urine of pregnant and parturient women, apparently in good health, has shown that albuminuria and the presence of form-elements are common occurrences. Small amounts of albumin are found in about four per cent. of all women during pregnancy, and in one-third of women during labor. What is still more remarkable, during the last month of pregnancy the urine of nearly all women contains hyaline casts and leucocytes. This change in the secretion of the healthy kidney is known as the kidney of pregnancy, and is doubtless chiefly due to the increased abdominal pressure; but maybe there also is a toxic agent at work. The kidney of pregnancy is commonly found in the second half of pregnancy and particularly among primiparæ. It is accompanied by some œdema of the lower extremities ; but otherwise it does not give rise to symptoms ; and, as a rule, the urine becomes normal again shortly after delivery.

In other cases it is only the precursor of acute or chronic nephritis and may lead to eclampsia. The transition from a normal condition to a most dangerous one is then almost insensible, so far as the kidneys are concerned, and, as we have said above, the secretion should be carefully watched, especially towards the end of pregnancy.

If women who are suffering from chronic nephritis become pregnant, the kidney disease is aggravated, and interruption of pregnancy is therefore often indicated. The diagnosis is based upon the history of the case and on the presence of fatty, granular, or waxy casts.

Acute nephritis may also develop, and is characterized by the presence of numerous red blood-corpuscles in the urine and a rise in temperature.

All kinds of inflammations of the kidneys are apt to be accompanied by hemorrhages. Most common is the loosening of the normally inserted placenta, which frequently becomes the cause of the death of the fœtus and may also endanger the life of the mother. Frequently the placenta is found to contain white infarcts. Small infarcts are quite common in the placentæ of healthy women, but large ones are mostly allied with albuminuria. These infarcts are formed by endarteritis of the villi of the chorion.[1]

In other cases bleeding from the intestine, nose, and mouth has been observed.

A particular form of inflammation of the eye—*retinitis albuminurica*—has also been described.

Treatment.—The strictly normal kidney of pregnancy does not call for any therapeutic interference ; but as soon as the limit seems to be passed, the treatment described for the premonitory stage of eclampsia is indicated ; and if the condition assumes a serious aspect pregnancy should be brought to an end.

§ 22. **Fever of Pregnancy.**—Some authors have described a fever for which they could find no other reason except pregnancy itself. It has a remittent type, becoming worse towards evening. The patient becomes hot, restless, and cannot sleep. She loses flesh. Sometimes she has an intolerable sensation of heat in the genitals. The disturbance may begin early and last during a large part of pregnancy and even till its end.

Cold applications of plain water or a lead-and-opium wash may be tried and antipyretics given internally.

§ 23. **Icterus.**—A pregnant woman may develop a common catarrhal icterus which runs its usual course and is treated with the same remedies as in the unimpregnated. But there is a tendency during pregnancy to develop a malignant form of jaundice, called *icterus gravis*, which is an exceedingly dangerous disease, in most cases connected with *yellow atrophy of the liver*. Whether it is due only to pressure on the ducts leading the bile from the liver and gall-bladder to the intestine, or there comes an infectious element into play, is not known.

---

[1] Withridge Williams, Johns Hopkins Hospital Reports, vol. ix.

Frequently the child is dead and still oftener it is born icteric.

In view of the comparative frequency with which the malignant form of jaundice appears in pregnant women, it is wise for the physician to be reserved in his prognosis in any case of icterus occurring during pregnancy.

§ 24. **Progressive Pernicious Anæmia.**—We know that normally the blood of pregnant women becomes more watery and contains less hæmoglobin than that of the unimpregnated. We have also seen that œdematous swelling, especially of the lower extremities, is quite common and does not forebode any ill. But sometimes the limits of the normal are overstepped. Pregnant women are more liable than others to fall victims to that mysterious and dread disease known as pernicious anæmia. It appears commonly in the second half of pregnancy. It is likely to cause abortion or premature labor, and is nearly always fatal. When the diagnosis is made, which is based upon the undisturbed nutrition combined with pallor, great weakness, tendency to hemorrhage, and great destruction of the red blood-corpuscles, an attempt should be made to arrest the disease by means of the extract of red bone marrow in large doses, a tablespoonful three or four times a day, together with a rich albuminoid diet and pure strong wine. But if a decided improvement does not soon begin, pregnancy should be interrupted, and the same treatment continued; or other remedies substituted, especially arsenic, and if there is no hemorrhage, chalybeates. But even after the uterus has been emptied the prognosis is very doubtful.

§ 25. **Leucocythæmia, or Leukæmia.**—In normal pregnancy the number of leucocytes is increased, but in rare cases a true leucocythæmia develops. Then there is an enormous increase in colorless blood-corpuscles, and there appear large mononuclear cells without hæmoglobin and nucleated red blood-corpuscles. The disease does not pass to the fœtus; nor does it, if congenital in the fœtus, implicate the mother, showing that the partition between the maternal and fetal organisms in the placenta is impermeable to colorless blood-corpuscles. The chronic form has less influence on pregnancy, although it sometimes leads to miscarriage; but it appears also in an acute form, which ends in a few weeks, and usually leads to the death of the fœtus.

If the mother's condition becomes aggravated through pregnancy, it is proper to seek to better it by the artificial termination of the gestation.

§ 26. **Pemphigus.**—A small number of cases have been reported in which a vesicular eruption took place during pregnancy, disappeared after childbirth, and had a tendency to reappear in each following pregnancy. The eruption begins, as a rule, on the extremities, from which it extends to the trunk, but it hardly ever invades the head. It consists of red spots upon which appear vesicles varying in size from that of a pea to that of a walnut. They are grouped together. Their contents, at first serous, become mucopurulent. These blebs dry up and form a thick scab, after the fall of which the skin for some time presents a dark-blue color. The eruption is accompanied by a burning and itching sensation which prevents the patient from sleeping, causes fever, loss of flesh, and general debility.

As treatment, alkaline washes and internal tonics, such as iron, arsenic, strychnine, cod-liver oil, quinine, etc., are recommended.

§ 27. **Impetigo herpetiformis** is a very serious disease, since of five patients described by Hebra four died. During the latter months of pregnancy there appears at the groin, at the umbilicus, on the breasts, in the armpits, and later in many other places, an eruption consisting of small pustules of the size of pin-heads, closely grouped together, and filled with a thick greenish-yellow fluid. These pustules dry up and form a thick brown scab, around which spring up new pustules whose scabs become merged in the first one. Gradually the circles join one another until, finally, the whole body is covered with the eruption. The patient has a continuous or remittent fever, the tongue becomes dry, and, as a rule, the issue is fatal.

Treatment.—It is proper to prescribe arsenic internally and dermatol and similar powders externally.

§ 28. **Mastitis.**—The development of the mammary glands during pregnancy sometimes leads to an inflammation and formation of an abscess. In some cases the starting-point is an eczema of the areola. The patient should lie in bed. Garrigues's waist (Fig. 239) should be applied, and outside of that an ice-bag. If an abscess forms, it must be opened and drained.

§ 29. **Eczema of the Areola.**—This is not very rare and causes annoyance by its itching, and may, as we have said, lead to mastitis. The affected part should be covered with compresses dipped in Burow's solution of acetate of aluminum, renewed when it gets dry, or rubbed with ointment of lead.

The same unguent is also smeared on a piece of muslin, with which the affected part is covered. Outside is placed a piece of gutta-percha tissue and then the waist. The ointment is used morning and evening.

rapid succession of the attacks and by the immediate danger to life it entails.

It is not a very rare disease, since it is found once in 330 cases of labor, and on account of the horrible spectacle it offers and the well-known dangers linked with it, those who are connected with lying-in institutions or make a specialty of obstetric practice have occasion to witness it much more frequently. It occurs most frequently during labor, but is not rare during pregnancy, and may even make its first appearance after delivery, but then, as a rule, during the first few days, and quite exceptionally several weeks later.

Symptoms.—In picturing this formidable disease, we shall consider separately the premonitory period, the attacks, and the intervals between the attacks.

The premonitory stage may be absent altogether, so that the convulsions break out without any warning in an apparently well woman; but in patients who are under constant supervision there are certain well-known symptoms which call attention to the threatening storm. The patient complains of headache, pain in the pit of the stomach (cardialgia), blurred vision, particularly noticeable in reading fine type or in sewing, black spots flitting before the eyes, and dizziness.

There is usually some œdema of the subcutaneous tissue. That of the lower limbs and vulva has comparatively little importance, since it may be produced by simple mechanical pressure on the veins in the pelvis; that of the hands and fingers, necessitating the removal of rings which before pregnancy were wide enough, is more suspicious, and an apparent broadening and flattening of the face, due to infiltration of the loose connective tissue surrounding the eyes, is still more significant.

The urine in nearly all cases contains a more or less considerable amount of albumin, sometimes so much that the whole mass solidifies by boiling. Its secretion is also much reduced, and its color is high.

Sometimes nausea and vomiting—although they have not been present during the first half of the pregnancy, when usually they are most common—appear. The patient may complain of restlessness and insomnia, and her friends may note in her an irritability of temper unknown before.

The attack proper comes on suddenly, the first thing noticed being little twitchings of the eyelids, followed by tonic and clonic spasms, extending over the whole face, the neck, the trunk, and the extremities. The contraction of the dorsal muscles predominating, opisthotonus is developed, while the arms and legs are being alternately flexed and extended in rapid succession, and the thumbs buried in the clinched fists. Even the musculature of the uterus partakes in the general convulsions, in consequence of which the labor proceeds with loss of blood weakens the mother and deprives her of some of her power of resistance.

The great fetal mortality may be due to different causes. It may be brought about by the hyperpyrexia,—that is to say, the accumulation of heat. It has been noticed that for every fifth of a degree of Fahrenheit's thermometer the pulse frequency increases by three beats per minute. Or death may be caused by asphyxia. The pleura and other membranes of the fœtus show numerous petechiæ, minute extravasations of blood due to attempts at breathing. It has also been found by experiments on animals that when the mother is near suffocation the exchange of gas in the placenta goes in the opposite direction to the normal, the fœtus giving off oxygen to the mother, which is proved by the blood in the umbilical vein being darker than that of the umbilical arteries.

Thirdly, the disease may be directly transferred from the mother to the child. While under normal circumstances not a blood-corpuscle or any other solid substance can pass through the barrier of the placenta, the disease itself may break down its integrity, and germs pass from the mother to the child. Thus the bacillus of typhoid fever, the spirillus of recurrent fever, the bacillus of erysipelas, the comma bacillus of Asiatic cholera, the pneumococcus, streptococci, staphylococci, and bacillus coli communis have all been found in the fœtus. In *scarlet fever* the fœtus seems to be affected at the same time as the mother. It may be born with the rash or in the stage of desquamation. The same is the case with *measles*. In *smallpox* the child may be born with pustules or cicatrices. In *malaria* the plasmodium has not been found in the fœtus, but the child has been born with a swollen spleen. When the mother has *influenza*, the child may be born with it, as evinced by sneezing, rapid respiration, high temperature, and frequent pulse. The *anthrax bacillus* has not been found in the fœtus, but the child is taken sick a few days after its birth, showing that infection probably takes place during birth, especially during the detachment of the placenta.

Perhaps the fœtus may also be killed by absorbing toxins from the mother.

Sometimes the death of the fœtus may be caused secondarily by premature uterine contractions excited by the overheated blood.

In *typhoid fever*, *cholera*, and *smallpox* hemorrhage often takes place in the decidua.

In cholera there is a sudden diminution in the liquor amnii. It is very dangerous, not only during pregnancy, but also during the first days of the puerperium.

Smallpox may affect one twin while the other escapes, and, what is still more curious, the child may be born with it although the disease did not affect the mother. If the mother had it during gestation, the child is refractory to vaccination. If the mother was vaccinated during pregnancy, vaccination sometimes takes in the child and sometimes not.

Pneumonia and *pleurisy* are exceedingly dangerous complications of pregnancy. If labor has not begun, everything should be done to postpone it. The induction of premature labor is contraindicated, because labor interferes with respiration and throws extra work on the heart. If, on the other hand, labor has begun, the sooner the patient can get through with it the better, and the accoucheur should, therefore, use every known means of expediting the process, such as dilatation of the cervix, version and extraction, or forceps delivery.

Erysipelas is one of the most dangerous complications of pregnancy, the streptococcus causing this disease and the worst form of puerperal infection being identical.

Influenza interferes with conception and is a frequent cause of abortion. It was noted that nine or ten months after a large epidemic in Switzerland there was a great diminution in childbirth, so that in 1890 there were 5287 less confinements than the average of the four preceding years.

Hydrophobia has been observed in few pregnant women. The children remained healthy.

Injuries are common, and if they lead to *septicæmia* the fœtus nearly always dies.

Smallpox and erysipelas are so exceedingly dangerous and so easily carried from one patient to another that, whenever feasible, doctors and midwives who have such a case on hand should abstain from going to a pregnant or parturient woman. If they are obliged to do so, they should change all their clothes, take an entire bath with corrosive sublimate, and pay extra attention to the disinfection of their hands.

CHAPTER IX.

COMPLICATION WITH CHRONIC DISEASES.

§ 1. **Syphilis.**—Among chronic diseases syphilis has the greatest influence on pregnancy. If the father has syphilis in the primary or secondary stage, both the mother and the fœtus become infected.

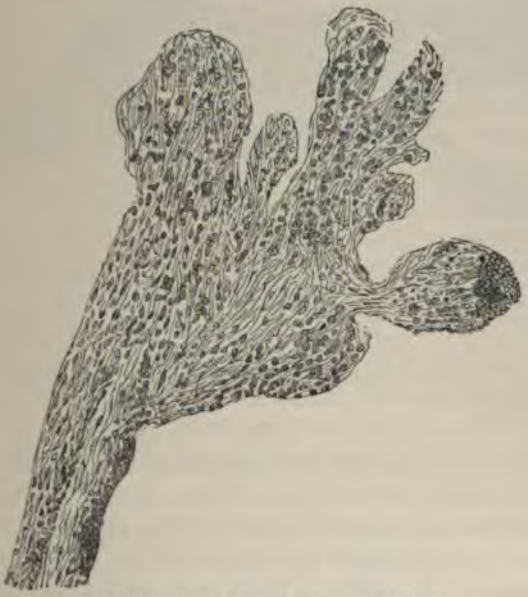
If the mother at the time of conception has syphilis in these early stages, she communicates it also to the fœtus. If she is healthy when she conceives and becomes infected later, the result in regard to the child differs. The nearer conception the infection occurs, the more likely is the fœtus to get the disease, but if the infection does not take place before the last three months of pregnancy the fœtus nearly always escapes contamination.

A woman may live with a syphilitic man for years without being infected, but when she becomes pregnant by the same man, she may become infected through the fœtus, by what the French call *choc de retour*.

When the man is in the tertiary stage of syphilis, both mother and fœtus may escape infection. If the disease is old in both parents, the child may be born apparently healthy, but syphilis is latent in it and may break out after many years.

The same may be the case if the mother, during her pregnancy, undergoes thorough mercurial treatment.

Fig. 267.



Syphilitic villus of the chorion. (Fränkel.)

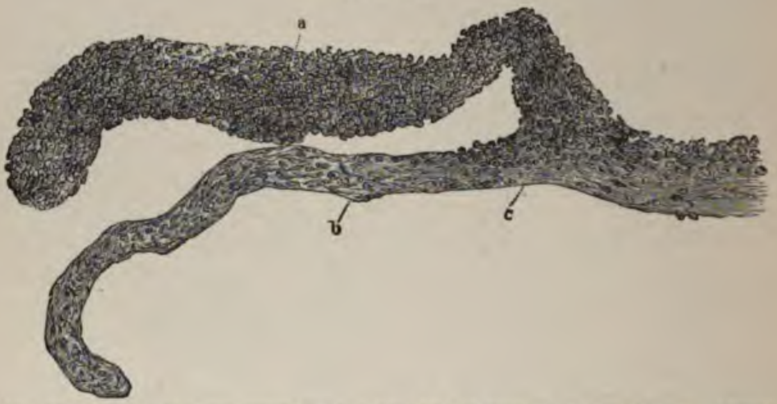
Syphilis in the mother exercises its influence on the fœtus longer than that of the father; but, as a rule, the parental influence ceases after a lapse of from four to six years. Exceptionally it may continue ten years or more, one abortion following the other.

Often the syphilitic fœtus is expelled in the earlier months of pregnancy. If development goes on longer, the fœtus is born in a macerated condition. The time of the occurrence of abortion is commensurate with the time elapsed since the parents were infected. Thus, in successive pregnancies abortions are followed by premature labor, until finally sometimes a viable child is born.

The cause of the death of the fœtus and the miscarriage is found in the placenta, which is unusually large and heavy. In the interior of the villi of the chorion numerous round and spindle-shaped cells are produced, which compress and finally obliterate the blood-vessels. The epithelium of the villi undergoes also a cell proliferation, and the whole villus becomes swollen. (Figs. 267, 268).

The maternal part of the placenta becomes the seat of a gummous endometritis, forming nodules of connective tissue. The liver and the spleen are swollen and may weigh three times as much as normal. The junctions of the diaphyses and the epiphyses undergo great changes, which will be described later. (See DISEASES OF THE NEW-BORN.)

FIG. 268.



Villi from the line of demarcation between healthy and diseased placental tissue. (Fränkel.) *a*, swollen villus filled with granulation cells; *b*, slender, almost healthy villus; *c*, transition from healthy to diseased villus.

As soon as a pregnant woman affected with syphilis comes under observation, she ought to be treated with mercury. This drug is not only borne well by mother and child, but the number of miscarriages and premature labors is much diminished under its use.

If the mother aborts or gives birth to a macerated child, she ought to undergo mercurial treatment before a new conception takes place, and probably the husband will need the same cure.

§ 2. **Tuberculosis.**—Pregnancy has a bad influence on tuberculous patients. The ravages of the disease continue, and the weakening influence of the puerpery is still more deleterious. Sometimes the patients die, and then, as a rule, when the fatal issue approaches, the child is born before the normal term. Otherwise the disease rarely causes abortion or premature labor. Fortunately, tuberculous patients are less apt to conceive. Their children are mostly small and weak; but exceptions are not rare when a tuberculous mother gives birth to a plump child.

A direct transfer of tubercle bacilli rarely takes place. If it does, the epithelial cover of the villi of the chorion and the interior of the villi are found diseased. Blood-vessels become obliterated, caseous foci are formed, and the fetal blood swarms with bacilli. The suprarenal capsules have also been found in a caseous condition.

If the direct transition of bacilli is rare, there can be no doubt about the disease being frequently inherited from the mother. The same applies to the father, in which case we must suppose a so far inexplicable infection through the semen. In both cases the disease may not appear for many years. Perhaps it then is due to direct infection later in life.

A tuberculous mother ought not to nurse her child.

§ 3. **Heart Disease.**—In itself a dangerous condition, valvular heart disease becomes much more so during pregnancy, when even under normal circumstances the heart has to perform increased work. If the valvular disease is perfectly compensated, pregnancy may have a smooth course; but if the compensation is imperfect, the prognosis is doubtful. Dyspnœa, cyanosis, anasarca, ascites, albuminuria, hydrothorax, and pulmonary œdema may develop; an embolus may cause apoplexy or a fibrinous clot form in the heart, or fresh endocarditis may increase the obstruction to circulation. Sudden death may occur either during pregnancy, during labor, or in the puerperium through paralysis of the heart. In pregnancy a fatal exit is not common, but the exertion of labor is particularly dangerous, and there is still a considerable mortality during the puerpery.

The moment following the expulsion of the child is particularly dangerous, which probably is due to the diminished abdominal pressure, when all the large abdominal vessels become overfilled with blood, and there is a temporary lack of blood in the heart, which may arrest its motion.

Heart disease often causes abortion or premature labor.

Treatment.—The pregnant woman suffering from heart disease should be spared all physical exertion and mental emotion. If her condition becomes dangerous, it may be necessary to perform artificial abortion. Induction of premature labor is less often indicated. The membranes should be ruptured early, since the escape of liquor amnii already gives some relief from the dyspnœa. During labor the patient will, as a rule, be unable to occupy the common postures on the back or the left side, and must sit up in order to breathe. Labor should be abbreviated as much as possible by artificial dilatation of the cervix, the high forceps operation, or version. For anæsthesia ether should be used, which stimulates the heart, while chloroform is particularly dangerous. The hypodermic administration of digitalis, strophanthus, strychnine, and nitroglycerin may prove highly serviceable.

It is well to have in readiness a sand-bag weighing eight or nine pounds and to place it on the abdomen the moment the child is expelled or extracted.

Endocarditis may develop during pregnancy in otherwise healthy women, and is easily overlooked, unless an apoplectic attack leads the attention to the heart.

Exophthalmic goitre gets worse during pregnancy, and can become the cause of abortion.

§ 4. **Hæmophilia** is, fortunately, a rare disease, and those who are affected by it are likely to succumb to hemorrhages following small injuries before reaching the childbearing age. If a woman suffering from this disease becomes pregnant, there is considerable danger of serious hemorrhage occurring during pregnancy or labor. Hemorrhage may take place in the decidua, leading to abortion, and during any of the stages of labor, especially the third, or immediately after the expulsion of the placenta, the patient may bleed to death.

Knowing the disposition of the patient to hemorrhage, the accoucheur must be prepared to combat it in every way, with tamponade, styptics, ligature, faradization, ice, hot water, or thermocauterization.

§ 5. **Hernia.**—Hernia being so common a condition, it is a frequent complication of pregnancy and childbirth, but, as a rule, it does not give much trouble. Old inguinal and femoral herniæ may even disappear during pregnancy, the intestine being pushed up by the growing uterus and pulled out of the inguinal or crural canal. On the other hand, an umbilical hernia, by the distention of the linea alba, especially among pluriparæ, is apt to make its first appearance or get worse during pregnancy. In rare cases the intestine may be compressed in Douglas's pouch. The writer has seen an inguinal hernia form in a first pregnancy in a woman who had never had one, and in whom it disappeared again shortly after the birth of the child. It is easy to understand the mechanism of such an accident. By the growth of the uterus the abdominal wall becomes distended and the inguinal canal enlarged, so as to facilitate the passage of the intestine, and during involution the canal becomes again narrow enough to resist the escape of the gut.

An umbilical hernia should be kept back with a pad and spring, but trusses cannot be applied to inguinal or femoral herniæ. In the case referred to above the hernia caused pain, and was successfully kept back with a pad and elastic narrow silk strap surrounding the pelvis, made by the Pomeroy Truss Company, on Union Square, New York.

If a hernia becomes incarcerated, taxis should be tried, and if successful, some such supporter should be used to keep the intestine in. If it is not possible to replace it, herniotomy must be performed.

Induction of premature labor has also given a good result. During labor the hernia should be kept back manually, and if there is any pressure on it delivery should be expedited with the forceps.

CHAPTER X.

DEATH OF THE MOTHER DURING PREGNANCY.

THE laws of most countries prescribe that if a pregnant woman dies, and the fœtus is alive and at a period of development at which it is viable, it shall be the duty of the physician to perform Cæsarean section on the body,—that is to say, cut through the abdominal and uterine walls and remove the child. This was already a law with the old pagan Romans, and the Roman Catholic Church, desiring to give the child the benefit of the baptismal rite, inculcated the same. Numerous operations of this kind have been performed, but the outlook for delivering a living child and for its remaining alive is poor indeed. Puech found that in 331 operations, 101 children showed signs of life when born, but only 43 continued to live. The fœtus dies of asphyxia very soon after the mother. To have any chance of success, the operation must be performed within a few minutes after the death of the mother. Ten minutes later there is very little hope of saving the child, although there is a case on record in which the fœtus was extracted twenty-three minutes after the death of the mother; it was deeply asphyxiated, but survived. The chances are best when the mother is suddenly killed by some injury, but how rarely will a physician then be present and be prepared to operate! If she dies of some protracted disease, the chances are that the fœtus is nearly dead when she dies. He must watch her heart with the stethoscope, and when it stops pulsating ascertain that the fetal heart still beats. If he is precipitate in his action, he may share the fate of that practitioner who thought he was operating on a corpse, but the pain of the incision revived the mother, and the operator fled in dismay.

Deliberately to operate while the mother is dying, as has been recommended, seems to the writer utterly revolting and barbarous, unless the mother herself wishes it. The operation must, of course, be performed without any kind of general anæsthesia, which would hasten death.

If the woman is really dead, the operation is simple enough, and might in the absence of the usual instruments be performed with a razor or any sufficiently sharp knife.

A living child may even be born by the natural way after the death of the mother. Somatic death is a protracted process, and it is not incomprehensible that the uterus may contract and expel the child after the mother's heart has ceased beating.

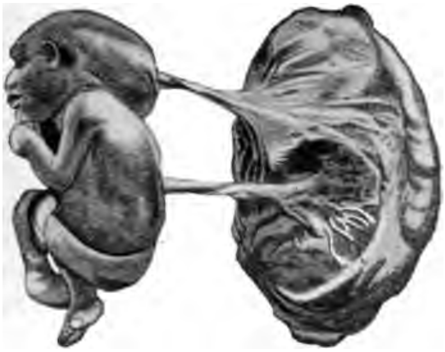
If the mother dies during labor, it may sometimes be possible for the accoucheur to express or extract the child per vias naturales.

CHAPTER XI.

DISEASES OF THE OVUM.

§ 1. **Amniotic Bands.**—Not infrequently solid or hollow bands are found extending from the skin of the fœtus to the inside of the amniotic cavity (Fig. 269), or between different parts of the fœtus (Fig. 270). These strings may cause intra-uterine amputation of limbs (Fig. 271), the cut-off parts sometimes being found in the liquor amnii. The bands may also prevent a whole limb from being developed, or they may compress the cord and thus cause the death of the fœtus, or the adhesion between the ovum and the fœtus may be placed so as to prevent the formation of the cord. When a tubular band has been recently torn off from the fœtus, the corresponding part, usually the back of the head, will show a defect in the skin, like a wound.

FIG. 269.



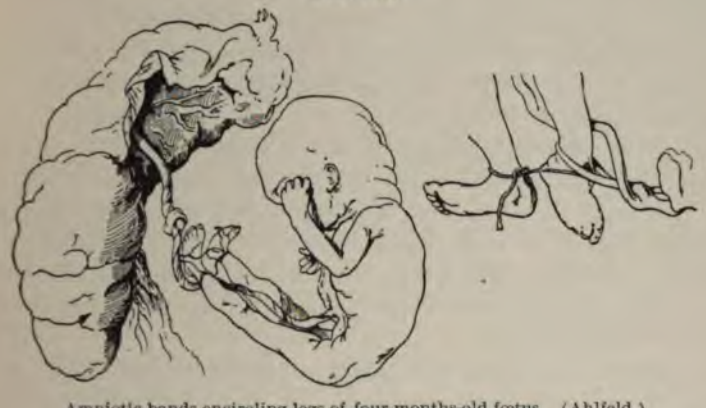
Amniotic bands extending from fœtus to amnion. (Pinard.)

These bands are doubtless due to a kind of arrest of development, the amnion not separating all over from the fœtus by intervening liquor amnii, but remaining in contact in some places with the fœtus. Thus broader adhesions would be formed, but when the liquor amnii increases in amount these adhesions are drawn out in the shape of strings or tubes.

§ 2. **Hydramnion, or Hydramnios.**—Hydramnion is a dropsy of the amnion, too large an amount of liquor amnii. It is not possible to define the limit where hydramnios begins. The normal amount of amniotic fluid is two or three pounds, but we hardly call the excess hydramnion unless it gives rise to some discomfort or danger.

Etiology.—Hydramnion is much more common among pluriparæ than among primiparæ. It is often combined with twin pregnancy, and quite frequently the fœtus is malformed or diseased. In a general way we may say that anything that increases the secretion or interferes with the resorption of the liquor amnii may be a cause of hydramnion. The cause is by far more commonly situated in the ovum or the fœtus than in the mother. In speaking of the ovum at term (p. 66) we have said that the amnion has neither nerves nor blood-vessels, but at an earlier stage arteries, veins, and capillaries, the so-called *vasa propria*, are found, which later become solid fibrous strings, and are normally closed two months before the end of pregnancy. If these vessels abnormally remain open, a transudation of serum takes place through their walls, giving rise to hydramnion. In other cases the amnion is found inflamed, thickened, and its epithelium in a state of cell proliferation. Sometimes a stenosis has been found in the umbilical vein or a cirrhotic liver of syphilitic origin or valvular disease in the fetal heart or stenosis of the ductus Botalli, all of which would cause a stasis of blood and transudation of serum.

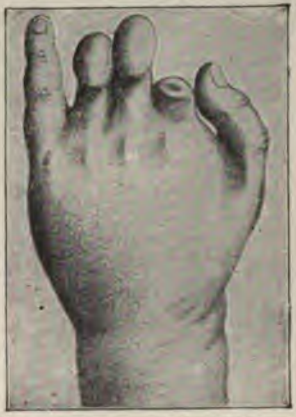
FIG. 270.



Amniotic bands encircling legs of four-months-old fœtus. (Ahlfeld.)

Very often fetal anomalies are found, such as hydrorrhachis, exstrophy of the bladder, hemicephalus, cleft palate, harelip, adhesions of the amnion to the surface of the fœtus or to inner organs in still open cavities, where blood-vessels may lie freely exposed in a condition favoring transudation of serum. In one case the fetal skin was the seat of nævi.

FIG. 271.



Intra-uterine amputation of fingers. (Olshausen-Veit.)

In the mother has been found Bright's disease, heart disease, or liver disease, causing anasarca and dropsy of the cavities of the trunk; syphilis, leukæmia, or anæmia.

Symptoms.—Hydramnion causes a great distention of the abdomen. As a rule, it develops slowly towards the end of pregnancy. Usually the uterus is felt distinctly fluctuating, but sometimes it is so tense that no fluctuation is perceived, and it feels quite hard. Per vaginam we feel the lower uterine segment bulge downward, and the cervix drawn high upward and backward. It may be obliterated and the os dilated, but, strange enough, the ovum itself is flaccid. As a rule, no presenting part is felt, because the fetus occupies an abnormal situation. Through the abdominal wall the uterus is felt having a globular shape, a great deal of water is displaced before we reach the fœtus, often the small parts cannot be felt at all, and the larger portions of the fœtus, as well as the place where the fetal heart is heard easily, shift position.

The great distention of the uterus causes neuralgia, dyspnœa, and swelling of the lower extremities, or even thrombosis of a vein.

Diagnosis.—If we are sure that the patient is pregnant, there is no difficulty in diagnosticating hydramnion. Otherwise her condition might be due to an ovarian cyst. Great attention should therefore be paid to the fetal heart-sound.

Prognosis.—The prognosis for both mother and child is less good than in normal pregnancy. Hydramnion not only causes discomfort and suffering, but labor may set in prematurely, or the interference with circulation may become so great that induction of premature labor becomes necessary. The sudden escape of a large amount of liquor amnii and consequent lack of blood in brain or heart may cause loss of consciousness or heart failure. The placenta is apt to become detached before the time, and the overstretched uterus may not contract well, which again may cause tedious labor or hemorrhage after the birth of the child. Faulty presentation may call for operative interference.

For the child the prognosis is still more serious. Many of the children die either during labor or shortly after. They are often atrophic or malformed. The premature detachment of the placenta may cost the child its life, and the faulty presentation also militates against it.

Treatment.—The membranes should be punctured, care being taken not to let all the water run off suddenly. Since the fœtus often is small and weak, the induction of premature labor should be deferred as long as possible.

ACUTE HYDRAMNION.—We have said that, as a rule, hydramnion develops gradually towards the end of pregnancy, but there is a form of the disease which develops in the middle of pregnancy, between the fourth and the sixth month, reaches in a very short time large proportions and is accompanied by pain and vomiting. This form is found with twins occupying a single ovum. Only one amnion is affected. The explanation probably is that one fœtus has a stronger heart than the other. By its contractions the blood is driven to the other heart, where a stasis is developed with hypertrophy of heart and kidneys and consequent transudation into the amniotic sac.

§ 3. **Scanty Liquor Amnii.**—The amount of liquor amnii may be reduced to a tablespoonful. The cause is in most cases unknown. In one it was closure of the fetal urethra. The condition may seriously interfere with the development and mobility of the fœtus. Otherwise it is of no practical importance.

§ 4. **Cystic Degeneration of the Villi of the Chorion; Vesicular Mole.**—This disease is sometimes called *uterine hydatid*, an unfortunate name based on the totally erroneous idea that the vesicles that characterize it were analogous to those produced by echinococci. It is a cystic degeneration of the villi of the chorion, which may extend over the whole surface of the ovum, or be limited to the placenta or even to a part of the same. Sometimes the degeneration has progressed so far that there is no trace of fœtus or umbilical cord; nay, even the amniotic cavity may have disappeared, so that nothing is left but a mass of vesicles and pedicles having some resemblance to a bunch of grapes (Figs. 272, 273). In other cases there may be an amniotic cavity, with or without fœtus; and finally the morbid process may be so limited that the fœtus is developed normally and the child is born alive and viable.

When the degeneration extends over a large portion of the ovum, the decidua is perforated by it, and sometimes the degeneration works its way into the muscular coat of the uterus, or it may even perforate the peritoneum, causing death by intraperitoneal hemorrhage.

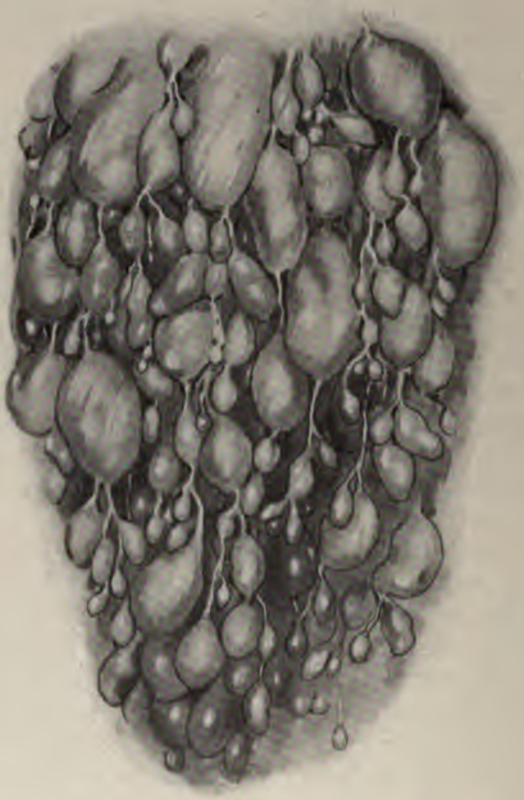
The diseased mass consists of vesicles and pedicles intimately connected with the decidua. The vesicles vary in size from a pin's head to a hen's egg, and are colorless and translucent. The smaller are semi-solid, much like the gelatin of Wharton in the umbilical cord; but the larger they are, the more watery is the fluid. It contains albumin and mucin, but the latter diminishes with the development of the vesicles. While the smaller vesicles contain blood-vessels, these disappear in the larger. The pedicles are very thin, mostly solid, but sometimes hollow. The distribution differs from that in a bunch of grapes in so far as not all vesicles have a pedicle of their own, springing directly from the main trunk or its branches. One vesicle may become connected with another, the pedicle swelling up in several points to form vesicles like the beads on a rosary. If the intervening stalk is hollow, the fluid may be pressed from one vesicle into the other. The whole mass may grow to the size of an adult's head and weigh three or four pounds.

The process begins as a cell proliferation in the syncytium and the epithelium of the villi, and the connective tissue forming their stroma is liquefied.

In most cases the degeneration leads to abortion in the fourth or fifth month, but in some the morbid mass has remained in the uterus and even continued to grow for twelve or thirteen months.

Fig. 272.

N.?



Cystic degeneration of villi of the chorion.

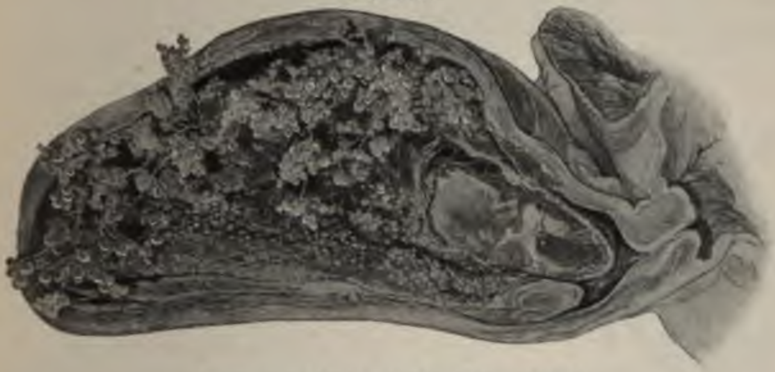
In twin pregnancies one ovum may be healthy, the other the site of a vesicular mole.

The *etiology* is unknown. The disease is more common in advanced age than among young women. The same woman may be thus affected in several pregnancies. Some suppose therefore that there is a maternal predisposition before pregnancy, probably an endometritis. The disease is rather rare.

Symptoms.—In the beginning the growth of the uterus may remain behind the norm, but later the organ grows much faster than one containing only a normal fœtus. Very often hemorrhages occur. Some vesicles may be expelled, which settles the diagnosis at once. Otherwise we are compelled to rely upon the combination of the two other symptoms, hemorrhage and unusual size of the uterus.

The *prognosis* is rather serious. Not only may the mother be weakened by repeated hemorrhages, or even die in consequence of them, but the very dangerous disease known as *deciduoma malignum* has been particularly found to follow the expulsion of a vesicular mole. Sometimes the vesicular mole has been found in women suffering from albuminuria, and then the prognosis is very much worse.

FIG. 273.



Uterus containing a vesicular mole. (Ahlfeld.)

As to the fœtus, it is mostly destroyed or killed by the disease, which blocks up the channels of nutrition and respiration.

Treatment.—In the earlier months the case should be treated as we have described in speaking of abortion. The writer has dilated the cervix in the third month and curetted with Simon's sharp spoon, the morbid tissue removed filling an eight-ounce glass, without losing more blood than usual and without an untoward symptom during the convalescence. When the tumor is large, the curette, even a blunt one, becomes a very dangerous instrument on account of the possible extension of the diseased tissue into the wall of the uterus. The cervix must be fully dilated with instruments and manually, and pressure should be exercised on the fundus. As the tissue of the mole is very brittle, the accoucheur should not pull on it, but try to deliver the whole growth in one piece. If pressure does not suffice, he must introduce two fingers or his whole hand and use his nails as curette.

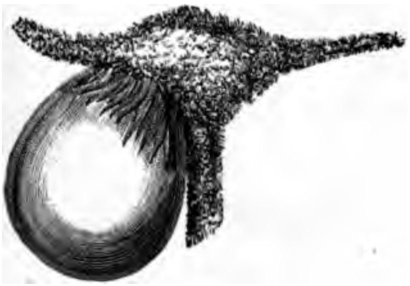
Since there may be a weak point in the uterine wall, it is better not to use intra-uterine irrigation. Hemorrhage must be combated with intra-uterine and vaginal tamponade, ergot, and faradization.

If a malignant tumor develops, the whole uterus must be removed by vaginal hysterectomy.

§ 5. **Cellular Hypertrophy and Hyperplasia of the Villi, or Myxoma Fibrosum Placentæ.**—Some of the villi of the chorion may form roundish, smooth, hard nodules in the placenta. If such a degeneration of the villi spread much over the placenta, it would interfere with the nourishment and respiration of the fœtus. So far the cases have had only pathological interest.

§ 6. **Diseases of the Decidua.**—ATROPHY OF DECIDUA.—The reflexa may be so little developed that it covers only part of the ovum (Fig. 274), or there may be places where it is thin. The serotina may occupy so small an area that the ovum becomes pedunculated and the fœtus imperfectly developed.

FIG. 274.



Imperfect development of decidua reflexa. (Duncan.)

HYPERTROPHY AND HYPERPLASIA OF THE DECIDUA.—On the other hand, the decidua may be of unusual thickness. It may then be retained at the time of expulsion and necessitate manual removal.

CYSTIC DECIDUA.—Cysts may form in the decidua.

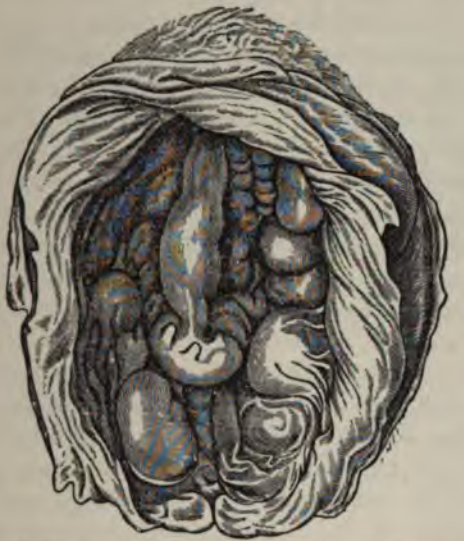
HEMORRHAGIC ENDOMETRITIS.—The spongy tissue of the decidua is very apt to tear, so that blood is extravasated into it and drives the chorion and amnion before it, forming protuberances on the inside of the ovum (Fig. 275). The fœtus may be destroyed, hemorrhages may be repeated, and the ovum transformed into a solid mass, mostly composed of coagulated blood and villi of the chorion and filling the uterus—a so-called *fleshy mole* (Fig. 276).

All these morbid conditions of the decidua, as a rule, end in abortion.

HYDRORRHŒA GRAVIDARUM.—During pregnancy there may be from the interior of the uterus a watery discharge of decidual or amniotic origin. The *decidual* hydrorrhœa is due to chronic endometritis. A serous fluid accumulates between the decidua vera and reflexa, and is from time to time expelled to the amount of several ounces or even a quart. After the free flow an oozing follows, which may continue for several hours or days. It then stops or may be replaced by a new copious discharge, a condition that may go on for weeks or months. Exceptionally it may, however, end in abortion.

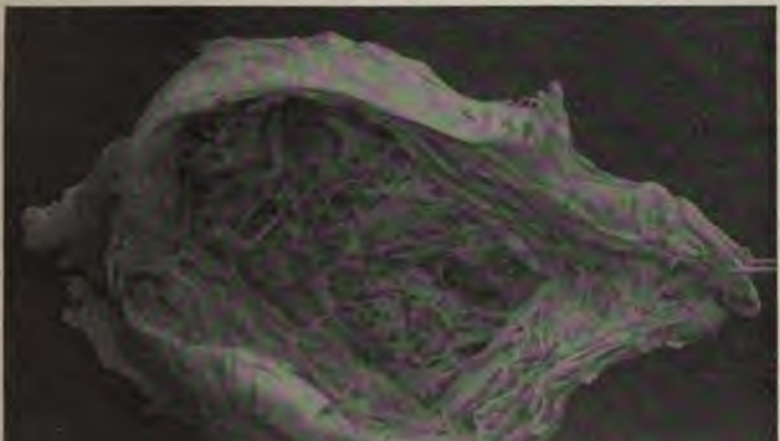
In *amniotic hydrorrhœa* a watery fluid may accumulate between the amnion and the chorion, until the latter ruptures, or the amnion and chorion may be ruptured together. The rupture may take place at some distance above the os, in which case the bag of waters may

FIG. 275.



Apoplectic ovum, the effused blood forming protuberances.

FIG. 276.



Fleshy mole. (Wood's Museum, Bellevue Hospital, No. 1133.)

form during labor, although liquor amnii had already escaped during pregnancy. The membranes have even been found perforated in their whole thickness by a small circular opening situated above the tear through which the fœtus has passed.

The amniotic, like the decidual, hydrorrhœa may be repeated and continue for weeks, but usually soon ends in abortion or labor.

Diagnosis.—If the fluid can be collected, the entirely characteristic composition of the amniotic fluid, with its masses of free fat, cells filled with fat, and lanugo, at once settles the question whether we have to deal with the decidual or amniotic form of hydrorrhœa. But, as a rule, the fluid is not available for examination. If after one or more flows the oozing stops altogether for weeks, it is certain that the fluid came from the decidua. If a very large amount is expelled at one time, say a pint or more, and oozing continues all the time, the fluid must have come from the amnion, and labor will soon follow.

The amniotic form of hydrorrhœa is of greater importance than the decidual. The patient should avoid all violent movements, and it is best to keep her in bed altogether. We should also do all we can to postpone labor by means of hypodermic injections of morphine, suppositories with opium, and the fluid extract of viburnum given by the mouth.

§ 7. **Anomalies of the Placenta.**—In the first part of this work we have already mentioned *double placenta* (p. 69 with Fig. 95) and the *battledoor placenta* (p. 70 with Fig. 96).

Calcareous incrustations are very common both in the maternal and the fetal part of the placenta.

White infarct is also quite frequent. It begins as an endarteritis in the villi of the chorion, which leads to necrosis of the tissue and formation of fibrin, that coagulates and forms in the placenta hard white nodules raised above the level of the fetal surface. If this degeneration is wide-spread, it may cause the death of the fœtus.

There may also be a *red, or hemorrhagic, infarct,* consisting of coagulated blood which comes from the blood-vessels of the decidua, and is pressed in between the villi of the chorion.

A *placental abscess* is an exceedingly rare occurrence.

On the other hand, an unusually tight *adhesion* between the placenta and the uterus is not very rare, and is due to decidual endometritis.

The placenta may be spread more or less over the whole ovum, and then it does not form the normal compact body, but is thin and flabby—*membranous placenta.*

Sometimes there is a well-formed placenta, but besides that there are one or more detached portions of placental structure—*placentæ succenturiatæ.* They are of considerable practical interest, as they may be overlooked, remain behind, and give rise to puerperal infection.

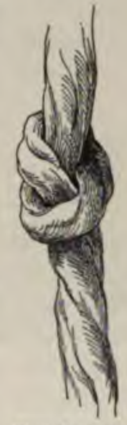
Occasionally the fetal surface of the placenta shows near its circumference a white fibrinous ring, over which the villi extend, while the amnion starts from its inner margin—*placenta marginata*.

All sorts of *tumors*—myxoma, fibroma, angioma, sarcoma, and cysts—are occasionally found in the placenta.

§ 8. **Anomalies of the Umbilical Cord.**—*Too Great Length.*—The cord, which normally is about twenty inches long, may have a length of a yard or more. The longest that has been put on record measured seventy inches. This abnormality is apt to lead to coiling around the fœtus or to prolapse.

Coiling.—The cord is very frequently wound around the neck. If it only goes around once or twice, there is no serious danger, the cord being easily pulled over the head by the accoucheur; but if the cord is wound many times around the neck and the circles are drawn tight, it may cause the death of the fœtus. In one such case there were eight tours. The danger is increased considerably if the cord is at the same time wound around an extremity, whereby it may become so tense as to cause the strangulation of the fœtus. In encircling the body it may leave a depression in the soft parts, and when it is wound around a limb it may even cut the soft parts to the bone.

Fig. 277.



True knot of umbilical cord.

True Knots.—Sometimes one or more knots (Fig. 277) are found on the cord, which are formed by the coil around the fœtus becoming loosened and the fœtus slipping through it. They rarely endanger the life of the fœtus.

False knots are only irregular accumulations of the gelatin of Wharton. They are exceedingly common and without importance.

Torsion.—The cord may become so twisted that the circulation through it is interfered with and the fœtus dies (Fig. 278).

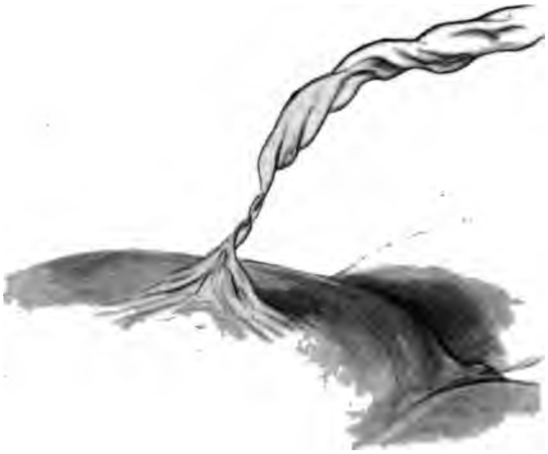
Stenosis.—The lumen of the umbilical vein or arteries may in some places be so small as to oppose a serious obstacle to circulation. This is especially the case with the openings left by the valves and diaphragms found in the interior of the umbilical vessels. Such narrowing may cause the death of the fœtus.

Too Short Cord.—Exceptionally the cord may be too short. In one case it has even been reported as measuring only one and a half inches. This may, as we shall see later, become a serious obstacle during labor.

§ 9. **Changes in the Fœtus after its Death.**—After death a small fœtus may entirely disappear, while the growth of the ovum continues for several months, and the whole is converted into a fleshy mole. A larger fœtus may undergo either maceration or mummification, while no putrefaction takes place: there is no odor of decaying animal tissue, and the saprophytes have not gained admission to the uterine cavity.

In the *macerated fœtus* (*fœtus sanguinolentus*) all the blood has disappeared from the organs, the red blood-corpuscles have been dissolved, and the whole body, especially the connective tissue, is infiltrated with a reddish serum. The epidermis is lifted up into vesicles filled with such sanguinolent fluid or torn off, hanging in shreds, and exposing a dark-red corium. The head forms a shapeless sac containing the more or less loosened cranial bones and a reddish-brown mass representing the brain, the structure of which is effaced. The muscles are imbued with serum and softened, the fibrillæ contain fat granules, but their striation is mostly preserved. The lungs may still be inflated. The liver is much decomposed, the cells being transformed into a fatty detritus mixed with pigment. In all other organs the parenchyma is in a condition of granular cloudiness, and often they are covered with a whole layer of crystals of margarin, cholesterin, and pigment.

FIG. 278.



Torsion of umbilical cord.

The *mummified fœtus* is dry, shrunken, and covered with a yellow skin. Mummification is found especially in fœtuses who have died from coiling of the umbilical cord around the neck or in twin pregnancies, where one twin dies and becomes compressed by the surviving fœtus until the former by lateral compression is reduced to a thin pad like a ginger-bread figure—*fœtus papyraceus.*

PART II.—ABNORMAL LABOR (DYSTOCIA).

Labor does not always run so smoothly as we have described it above. Quite the contrary. There are numerous conditions or accidents that cause a deviation from the normal, render childbirth difficult or impossible, and jeopardize the life of the mother, the child, or both.

The trouble may arise from faulty expellant forces; from the presentation, position, attitude, or size and shape of the fœtus; from multiple fetation; from abnormalities in the ovum; or from some obstruction in the parturient canal. The act may be complicated by hemorrhage, convulsions, or injury to the soft parts or the bony structures. The accoucheur must know all these possibilities; he must be able to recognize them when they arise or threaten; he must know how to prevent them or remedy them; or he must at least know the limits of his own knowledge and capacity, so as to be able to secure the necessary assistance or the co-operation of men possessing deeper insight, larger experience, or greater skill.

CHAPTER I.

FAULTY UTERINE CONTRACTIONS.

Uterine contractions may be too weak or come on with too long intervals; on the other hand, they may be too strong or continuous instead of being intermittent; and they may be accompanied by an unusual amount of pain.

Inertia of the uterus, or too weak contraction, is a common condition, and of very different importance according to the time of its occurrence. It may be primary or secondary. There may be too long intervals between contractions, or they may be of so short duration and so inefficient that they have no effect on opening up the uterus, so that the first stage may become protracted over several days. As long as the membranes are unruptured, this condition has no influence on the child, and little on the mother, except that it may be annoying to her, tax her patience, and make her nervous. In the second stage deficient contractions are much more serious both to mother and child. The water may drain off and the vagina become hot and dry. In the third stage deficient uterine contraction is of still greater importance and may become the cause of fatal hemorrhage.

Etiology.—Frequent childbirths predispose to it. Likewise general debility due to illness or a weak constitution. The musculature of the uterus may be too little developed, which is particularly found in a bicornute uterus. The muscular tissue has been found infiltrated with small round cells, characteristic of metritis; and chronic endometritis is often the starting-point. If the abdomen is much distended, as in hydramnion or twin pregnancy, the uterine fibres work at a disadvantage and cannot get a purchase. The use of chloroform is almost constantly accompanied by a weakening of the uterine contractions. Too rapid removal of the placenta or its retention in the uterine cavity often leads to deficient contraction in the third stage. Sometimes the cause is to be found in a distended bladder or a loaded bowel. At other times there may be an unfavorable position of the uterus,—as in a pendulous abdomen. But the beginner must be warned that in the great majority of cases insufficient contraction is due to some mechanical disproportion between the child and the parturient canal. Especially is this the case with the secondary weakness, when there have been good, perhaps even strong, contractions in the beginning and they later give out. Before arriving at the diagnosis of too weak uterine contractions, he should therefore carefully scrutinize the whole field.

Treatment.—In the opening stage, the patient should not lie in bed, but sit in a rocking-chair or walk about, or she may even to advantage attend to some household duty. We should endeavor to calm her mind and encourage her to be patient. Large vaginal injections with hot water are not so much in use now as some years ago, before our attention had been called to the danger of microbic infection. Still, by using a mild antiseptic fluid,—say, one-half of one per cent. lysol,—the danger may be obviated, and the remedy is sometimes effective. I have often seen excellent result from the introduction of a rubber bag into the vagina and its inflation with sterilized salt solution or lysol. Still more powerful is the insertion of a bougie through the cervix into the interior of the womb. If by so doing we rupture the membranes, not much is lost, since this is in itself a method to bring on uterine contractions; but if possible it should be avoided, since it is much better for both mother and child to have labor follow the natural course. Premature rupture of the membranes often leads to compression of the cervix between the brim of the pelvis and the head of the child, causing great pain and retarding labor. If the os is somewhat dilated, Barnes's dilators may be used, and if necessary, followed by Champetier de Ribes's unelastic bag (see OPERATIONS).

Sometimes mild friction of the abdominal wall against the fundus uteri increases the strength of uterine contractions or brings them on. For this purpose, the accoucheur, sitting at the bedside, seizes the abdominal wall in front of the fundus and slides it gently from side to side or in an anteroposterior direction. If this does not suffice, he may exercise more decided pressure on the fundus.

Even a mild galvanic current is recommended for the purpose of bringing on contractions, one pole being placed above the symphysis, the other at the fundus.

The contractions remaining unsatisfactory, it may become necessary to end labor by means of the forceps. This is an obstetric instrument consisting of two blades which are applied to the fetal head and serve to pull it out of the genital canal (see OPERATIONS).

The measures to be taken during the third stage will be considered below under HEMORRHAGE.

As to drugs the writer would warn against the administration of ergot, a substance which is apt to produce tetanic contraction and interferes much with all other measures. It should therefore be reserved not only for the third stage, but should not be given until it is sure that no surgical interference will be called for. Considerable benefit may be derived from antipyrin given in doses of ten grains every half-hour, half a drachm in all. Quinine has undoubtedly the property of strengthening weak contractions, but is apt to cause hemorrhage in the third stage. If the cause of the weak contractions is to be found in their painfulness, nothing works as well as a hypodermic injection of morphine or a few whiffs of chloroform.

TOO STRONG OR TOO FREQUENT CONTRACTIONS.—In some women the uterine contractions show an unusual violence. If there is no obstruction in the genital canal, this leads to a premature expulsion —so-called *precipitate labor*—which may have serious results. The child may be born before the mother has made proper arrangements for its birth. Labor may come on and run its course while the woman is sitting on a bench in a public park or riding in a car. Or she may think she is going to have an alvine evacuation, and while she is sitting in the water-closet the child is expelled into the hopper. If the os is not dilated, the cervix may be torn. If former childbirths have not left a wide entrance to the vagina, the perineum may be torn. These lacerations or the premature detachment of the placenta may give rise to hemorrhage. The mother may faint on account of the sudden lack of resistance, or she may lose all self-control and become delirious. The child may fall on the ground and sustain injuries to its head, or the navel-string may be torn. If this happens at some distance from its insertion on the abdomen of the child, the vessels may contract, whereby loss of blood is avoided, but an avulsion at or near the skin is apt to become the source of a fatal hemorrhage. These injuries to the child are particularly liable to happen if it is expelled while the mother is standing up; but fortunately, as a rule, she instinctively lowers herself to a crouching posture, which exposes the child much less to being wounded. If, however, birth takes place while the mother is sitting on a water-closet or a privy, the child may fall into the water or the dung and drown or become smothered.

If there is a serious obstruction somewhere in the genital tract, the condition becomes very serious for mother and child. The mother becomes agitated, her face is red, the pulse is full and rapid. She is prone to use abdominal pressure before the soft parts are properly dilated.

Etiology.—In some families the women have an hereditary disposition to precipitate labor. Too frequent or violent vaginal examination is apt to cause undue strength of the uterine contractions. Sometimes the patient is herself at fault by throwing herself impatiently from side to side or using the abdominal pressure during the opening stage.

Treatment.—When contractions are too severe or too frequent and there is no obstruction, they should be mitigated by hypodermic injections of morphine or the administration of an enema with tincture of opium or chloral, or by inhalation of chloroform. The patient should be deprived of all means by which she can increase abdominal pressure, such as support for arms and feet; she should be told not to bear down. She should be placed in the left-side position, and the presenting part should be pressed back with the palm of the hand so as to prevent too sudden a passage through the vulva.

Too Frequent, but too Weak Contractions.—Sometimes the contractions come too frequently, but are of short duration and of little or no effect. For this condition the hypodermic injection of morphine is the best remedy.

Tetanic Contractions.—The contractions may last too long, and come on so rapidly that there is hardly any interval between them, or they may even become continuous, a condition designated as *tetanus of the uterus.* This wears out the strength of the patient, and may so interfere with placental respiration or cause such pressure on the umbilical cord that the fœtus dies.

This tetanic contraction may be due to premature rupture of the membranes with the escape of all the liquor amnii, to cross presentation, a narrow pelvis, or any other serious impediment to the expulsion of the child.

Treatment.—Symptomatically chloroform is the chief remedy, but in connection with its administration the accoucheur must look for the cause and use appropriate measures for its removal.

Too Painful Uterine Contractions.—Normally every uterine contraction is accompanied by a certain amount of pain, which varies much in intensity in different individuals, but sometimes the sensation of pain is out of all proportion to the contraction, and even interferes with it. In such cases we must have recourse to chloroform at an unusually early stage.

CHAPTER II.

FAULTY ABDOMINAL PRESSURE.

UNDER ordinary circumstances it is chiefly during the stage of expulsion that abdominal pressure comes into play. When the os is fully dilated, the membranes rupture, and the fœtus begins to distend the vagina, the abdominal muscles contract in consequence of a reflex action. But even during the stage of dilatation the abdominal wall by its tonus offers a support for the contracting uterus.

The abdominal pressure may be absent altogether or too weak or too strong or premature. Cases have been observed where, in consequence of a fracture of the spinal column, there was a complete paralysis of the abdominal muscles. In cases of cleft pelvis the muscles lack the necessary fixation. A woman who gives birth to a child after having undergone tracheotomy, and while she is still wearing a canula in her trachea, cannot effect that closure of the windpipe which is a requisite for the production of abdominal pressure. Others suffering from dyspnœa in consequence of heart or lung trouble can only make an imperfect effort. Others again are pusillanimous. Having been spoiled or pampered in luxury, they are unaccustomed to pain and self-control, and have not the courage to press down when they feel the pain increase thereby. In deep anæsthesia the power of contraction is lost, and the abdominal wall becomes quite flaccid. In some multiparous women there is such a diastasis between the recti muscles that the uterus enters between them instead of being compressed by them. Large herniæ, abdominal tumors, tympanites, peritonitis, twin pregnancies, hydramnion, or an overdistended bladder may interfere with proper contraction of the abdominal muscles. If the corpus uteri by its contraction has pushed the fœtus into the cervix and vagina, it can do no more, and if then there is no abdominal pressure labor must stop.

Too early or too forcible abdominal pressure exposes the patient to tears of the soft parts of the genital canal. In some rare cases the sternum has been fractured transversely. If some alveoli of the lung give way under the violent pressure, the air may find its way under the skin, forming an *emphysema* of the face, the neck, and the thorax.

Treatment.—In cases of absence or too great weakness of contraction we should try to find the cause and to remove it. We must encourage the patient and explain to her the necessity of bearing down, promising her that if it increases her sufferings, it will abbreviate them. A full bladder must be emptied with the catheter. Tympanites may perhaps be overcome with a rectal tube or an ox-gall enema. If there is a superabundance of liquor amnii, it may be necessary to give some of it an outlet by rupturing the membranes. A pendulous or weak abdomen may be lifted or strengthened by surrounding it with a sheet upon the ends of which assistants pull so as to compress the abdominal wall. The uterus may be seized between the receding recti muscles and direct pressure exercised with the hands of the accoucheur. But if labor is arrested, artificial delivery by means of the forceps or version becomes necessary.

If a subcutaneous emphysema develops, we must stop all use of the abdominal pressure and deliver.

If the patient abuses the abdominal pressure, we must deprive her of all support for arms and legs and place her on the left side. If the contractions continue to be strong, they should be checked by the administration of chloroform. But if there is any obstacle to be overcome, we must remember that both strong uterine and abdominal contractions are nature's own remedy and not interfere with her work, unless there arise special indications for so doing.

CHAPTER III.

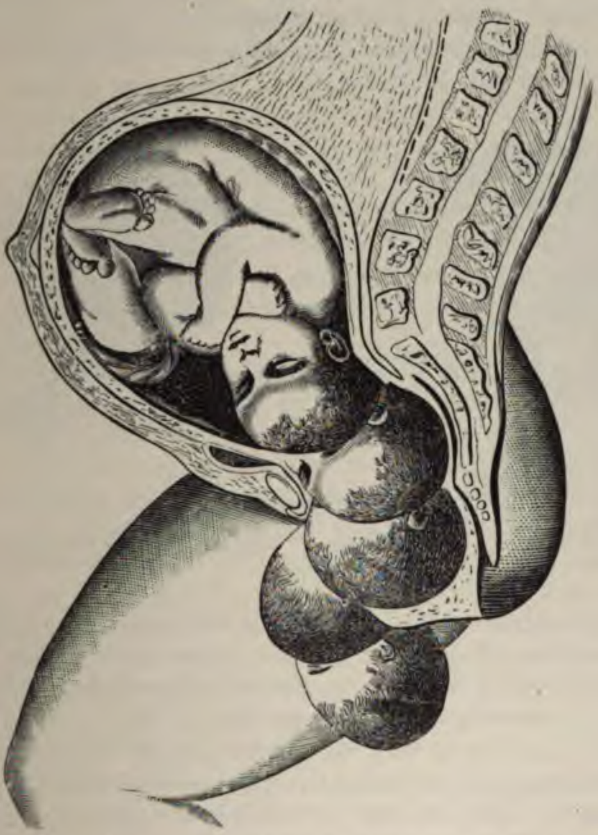
UNFAVORABLE POSITION, PRESENTATION, OR ATTITUDE OF FŒTUS.

THE advantages of the occipito-anterior position of the vertex presentation are so great that every deviation from this position and presentation must be looked upon as abnormal. In this category we have to consider the occipitoposterior position; the occipitolateral position; the lateral obliquity of the head; face, brow, pelvic, and cross presentations.

§ 1. **Occipitoposterior Positions.**—Occipitoposterior positions in vertex presentation are those in which the small fontanelle points respectively to the right or left sacro-iliac joint. The former is called the third or R. O. P. position, the latter the fourth or L. O. P. position. They may be *primary* or *secondary*,—that is to say, the occiput may from the beginning of labor point backward towards the sacro-iliac joint, or it may at first point forward in the direction of the iliopectineal eminence, and during the progress of labor turn backward. The latter is a rare occurrence. The occipitoposterior position is chiefly found when the child is small or the pelvis large or flat, in twin pregnancies, or with prolapse of the arm in front of the head.

In most cases nature herself remedies the abnormal position. The head is strongly flexed against the sternum, so that the part surrounding the small fontanelle strikes the pelvic floor first and by the resistance it meets here is turned forward, while the forehead is so high up that the anterior wall of the pelvis has no influence on it. The occiput has to follow the whole posterior wall of the pelvis, which is much longer than the anterior, the configuration of the head does not fit that of the pelvis, and in turning forward the occiput has to traverse about one-third of the pelvic circumference. Labor is, therefore, always more painful and protracted, but may end without interference on the part of the accoucheur, the third position being converted into the second and the fourth into the first.

FIG. 279.

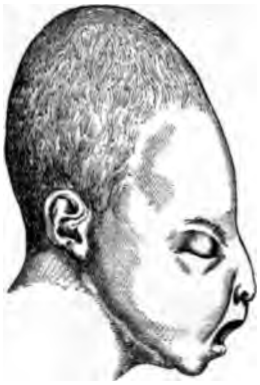


Mechanism of labor in persistent occipitoposterior positions. (Tarnier and Budin, l. c.)

If the favorable flexion fails to take place, and the head on the contrary becomes more extended, the large fontanelle dips low down in front and the sinciput is arrested at the pubic arch, a broad frontal protuberance being jammed against it, instead of as in normal labor the occiput slipping out under and in front of it. The head has to pass with a very large circumference, distending the perineum enormously, until the occiput gets free from its edge. Then an extension takes place, allowing the forehead and face to roll out under the pubic arch, and, finally, the body is born (Fig. 279).

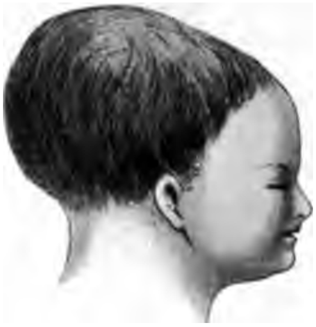
In consequence of the great pressure the forehead sustains in passing under the pubic arch, the head of the child becomes much elongated in the mento-occipital diameter, and gets a peculiar shape suggestive of a loaf of sugar (Fig. 280), which becomes particularly evident by comparison with Fig. 281, representing the shape of a head born in occipito-anterior position, vertex presentation.

FIG. 280.



Shape of head of child born in persistent occipito-posterior position. (Tarnier and Budin, l. c.)

FIG. 281.



Shape of head of child born in occipito-anterior position, vertex presentation.

Diagnosis.—The accoucheur arrives at the conclusion that he has to deal with an occipitoposterior position in the following way. By abdominal palpation he may feel the back of the fœtus turned backward in the mother's flank and the small parts turned forward in the opposite side. The fetal heart sound is heard under the level of the umbilicus farther out to the side than when the back is turned forward. But absolute certainty is reached only when he feels the posterior fontanelle pointing back in the direction of the sacro-iliac articulation or feels the anterior fontanelle pointing forward toward the anterior wall of the pelvis.

Treatment.—By pressing on the forehead of the fœtus with two fingers the accoucheur should strive to bring about the favorable flexure. With this he may combine pressure on the pubic side of the forehead, so as to facilitate its rotation backward.

If he does not succeed in this manœuvre, he should wait patiently so as to let the head come well down, since too early a use of the forceps is apt to be attended by great injury to the mother. He must especially beware of trying to correct the position by rotating the head with the forceps while it is still high up in the pelvis. He should first simply pull downward until the head reaches the pelvic floor. Then he may cautiously try to rotate the head with the forceps. Sometimes the rotation takes place spontaneously and carries the forceps along. As the convexity of the pelvic curvature would be rotated forward and would injure the soft parts of the mother, the instrument should be removed, and the rotation should be left to nature or finished manually. If necessary, the forceps may be reapplied for extracting the head after rotation has taken place.

But sometimes no rotation can be accomplished. Then delivery is brought about by means of the forceps, the occiput remaining backward. In the beginning the direction of the pull should be more forward than in occipito-anterior positions; but when the occiput has passed the perineum, the direction should be reversed, so as to help the forehead out and protect the nose from injury by pressure against the pubic arch.

§ 2. **Occipitolateral Position.**—This abnormality has received so little attention by American and English accoucheurs that it has no name. It is, however, not very rare, and it may offer a serious impediment to delivery. I refer to the condition characterized by the occiput failing to rotate forward, and the head descending with its occipitofrontal diameter through the transverse diameter of the pelvis.

Primiparæ, in whom the head normally engages in the pelvic cavity during pregnancy in the transverse diameter, are predisposed to this anomaly. It is apt to occur in the justo-major pelvis, in the flat rhachitic pelvis with large pelvic cavity, in a pelvis with insufficient inclination, or in cases of prolapse of an arm between the head and the anterior pelvic wall.

Sometimes the normal rotation forward of the occiput takes place late in labor, and then everything becomes normal. In other cases the occiput, on the contrary, turns backward into the hollow of the sacrum. Rarely the head can be born in the transverse diameter of the pelvis.

Diagnosis.—The posterior fontanelle is found in one side. Sometimes the anterior fontanelle may be felt in the opposite side. The sagittal suture lies in the transverse diameter of the pelvis.

Treatment.—Sometimes the position may be corrected by placing the patient on the side towards which the occiput points and placing a hard pillow under her flank. In other cases the desired rotation is obtained by having the patient occupy a half-sitting posture and bear down strongly, using special supports for arms and legs, as described on page 191 with Fig. 222.

We may try by digital pressure on the posterior parietal bone, near the occiput, to move this forward. This may be done more effectively by using a vectis or one blade of a forceps. In most cases extraction by means of the forceps becomes necessary, and as the position of the head is unfavorable for its application in the sides of the pelvis, it should be applied as nearly as circumstances permit to the sides of the head, favoring the forward rotation.

§ 3. **Lateral Obliquity of the Head.**—We have seen that normally in the beginning of labor the sagittal suture often is placed nearer to the promontory than to the symphysis pubis. This lateral obliquity of the head against the posterior shoulder may become so marked that it constitutes a hinderance to the progress of labor. The sagittal suture is then found running transversely quite near the promontory, and the brim of the pelvis is occupied by the anterior parietal bone—*anterior parietal presentation.* This condition is chiefly caused by a pendulous abdomen, and is therefore more common in pluriparæ.

But the head may also, although more rarely, be bent against the anterior shoulder, in which case the sagittal suture is placed transversely, close to or above the anterior pelvic wall, and the posterior bregmatic bone fills the superior strait of the pelvis. This is called *posterior parietal presentation.*

The head may be bent so much towards one of the shoulders that the ear presents, and then the situation may be designated as an *anterior* or *posterior ear presentation.*[1] These presentations are very rare in normal pelves. As a rule, they occur only in narrow pelves.

When the head is much bent to the side, neither the sagittal suture nor any of the adjoining fontanelles may be felt. The fontanelle felt is the posterior side fontanelle, which gives a sensation very similar to that perceived while touching the upper posterior fontanelle, three sutures meeting to form either of them. At the superior posterior fontanelle we have the sagittal and the two branches of the lambdoid suture; at the posterior side fontanelle it is the lambdoid joining the mastoparietal and the masto-occipital. But they may be distinguished by the adjoining bone. Following the sagittal suture, we meet the entirely smooth, evenly convex upper end of the occipital bone, while when we follow the lambdoid downward we come to the mastoid portion of the temporal bone, which presents rugosities formed by bony ridges and protuberances.

In making a full vaginal examination the accoucheur may come within reach of the fetal eye, which may suffer injury unless he proceeds with due gentleness.

---

[1] Garrigues, "Ear Presentations," Amer. Jour. Med. Sci., June, 1890.

In most cases the prognosis is favorable, as the head either changes its relations to the body under influence of labor-pains or can be manually replaced by the accoucheur. But if the abnormal attitude continues after the waters have broken, the condition is a serious one, as the head cannot pass through the pelvis when so placed.

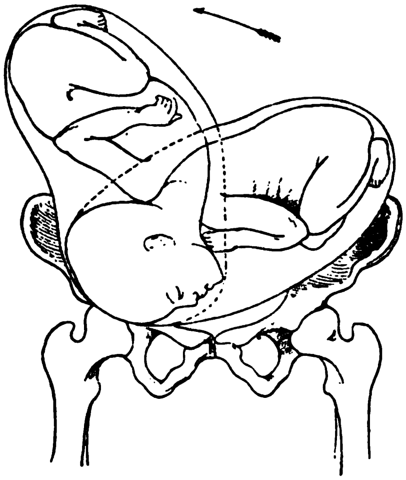
Treatment.—Before the membranes have ruptured, the presentation may be corrected by placing the woman on the side where the occiput is, pushing the fetal body over to the same side, and pressing the anterior portion of the presenting parietal bone upward. Thus the posterior superior fontanelle is brought downward and forward, and to keep it there the patient should remain in the lateral posture. In other cases it may be necessary to insert the whole hand and correct the malposition. In others, again, podalic version is resorted to. By this operation the fœtus is seized by one or both lower extremities and turned so as to be born with these foremost. (See OPERATIONS.) Even craniotomy has been performed, and those who are opposed to this procedure when the child is alive will have to substitute symphyseotomy. Craniotomy is an operation by which the size of the head of the fœtus is diminished by giving exit to part of the brain. In symphyseotomy the symphysis pubis is cut in order to enlarge the pelvis. (See OPERATIONS.)

§ 4. **Face Presentation.**—*Frequency.*—There is a remarkable difference in the frequency with which face presentations occur in the statistics of different lying-in asylums. While in the great Rotunda Hospital of Dublin it was observed only once in 497 cases of labor, in the Paris Maternity it occurred once in every 250 cases, and in German clinics even once in 169 cases. The discrepancy is so great that it hardly can be accidental. English obstetricians have thought to find the explanation in their systematic use of the left-side position; but in the New York Maternity Hospital, where the patient is allowed to lie as she likes during the earlier stages, and where most accoucheurs deliver the women lying on their backs, face presentations are still rarer than in the Rotunda. It is, in the opinion of the writer, much more likely that the comparative frequency of face presentations on the continent of Europe is due to the greater frequency of abnormal pelves.

Etiology.—Face presentation is found oftener in primiparæ than in multiparæ, which probably is due to the greater resistance of the lower uterine segment. It is more frequent when the back of the fœtus is turned to the right than when it is turned to the left. The explanation of this fact is probably to be found in the much more common occurrence of a version of the uterus to the right than to the left. When the breech of the child falls far over to the right side and the forehead hitches on the pelvic brim, there results a face presentation (Fig. 282), and the occiput is found in the side towards which the uterus is inclined.

If the occiput is unusually prominent, it is apt to be arrested at the pelvic brim, when the forehead and the face will be pushed down by pressure from above by the contracting uterus.

FIG. 282.



Face presentation due to lateroversion of the uterus. (Ahlfeld.)

The chin of a fat baby cannot be pressed so far against the sternum as that of a lean one, and consequently it may become farther and farther removed from the sternum during the progress of labor. Face presentation may also be due to a congenital goitre preventing the approximation of the chin to the sternum.

Monsters called hemicephali, in whom the cranium is missing (Fig. 319), present usually with the face. Any obstruction in the genital canal, especially a shortness of the transverse diameter, may lead to face presentation.

In rare cases the face presentation may be found before labor begins, but it is nearly always produced during and by labor, a vertex presentation being changed by extension into a face presentation. The face is mostly found with its mentofrontal diameter in the transverse or the oblique diameter of the pelvis. We may distinguish four positions, corresponding to the four vertex presentations from which they have been formed, the forehead occupying the place of the occiput.

In the *first position* the forehead is turned towards the left iliopectineal eminence, or lower down in the pelvis to the left foramen ovale, while the chin points towards the right iliosacral articulation.

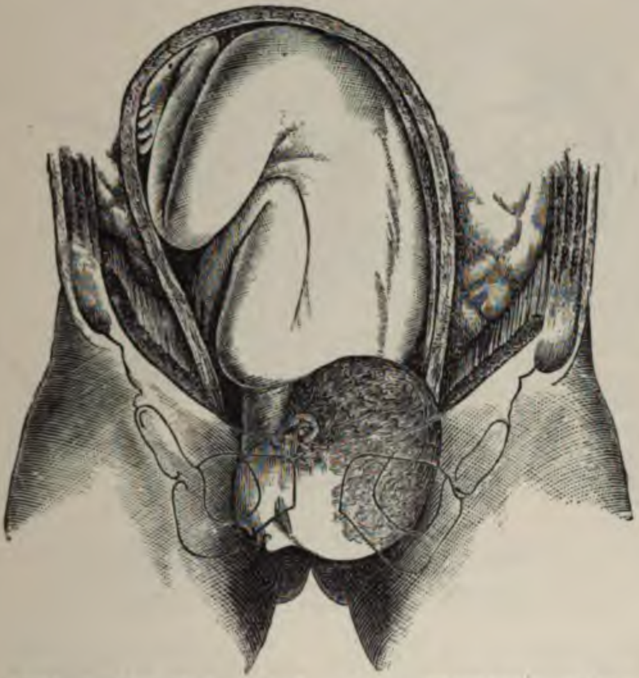
In the *second position* the forehead lies against the right iliopectineal eminence or foramen ovale and the chin is at the left iliosacral joint.

In the *third position* the forehead is at the right iliosacral articulation and the chin forward to the left pubic bone (Fig. 107, p. 77).

In the *fourth position* the forehead is found at the left sacro-iliac articulation and the chin forward to the right pubic bone.

Mechanism of Labor in Face Presentation.—In most cases the delivery may be accomplished by nature's sole efforts. Suppose we have the face in the first position (Fig. 283). When labor begins, the forehead is lower down than the chin. Then an *extension* takes place which allows the chin to come lower down—*descent*. This extension is brought about by the head forming a two-armed lever. That branch which is formed by the tissues situate between the foramen magnum and the occiput, being longer than the distance from the foramen magnum to the chin, is kept back by the greater resistance which it meets with, while the shorter branch descends under the pressure from above, which centres in the spinal cord articulating with the head. Next a *rotation* takes place, by which the chin is turned forward towards the pubic arch. This rotation is brought about in the same way as that of the occiput moving forward in normal labors,—namely, by pressure against the pelvic floor, especially the strong sacrosciatic ligaments. The anterior cheek—in the first position the right—descends a little ahead of the posterior. The anterior angle of the mouth appears first in the vulva, followed by the chin—in the first position under the right branch of the pubic arch. When the chin gets clear of the arch, a *flexion* (Fig. 284) takes place, the chin being pushed up in front of the

FIG. 283.



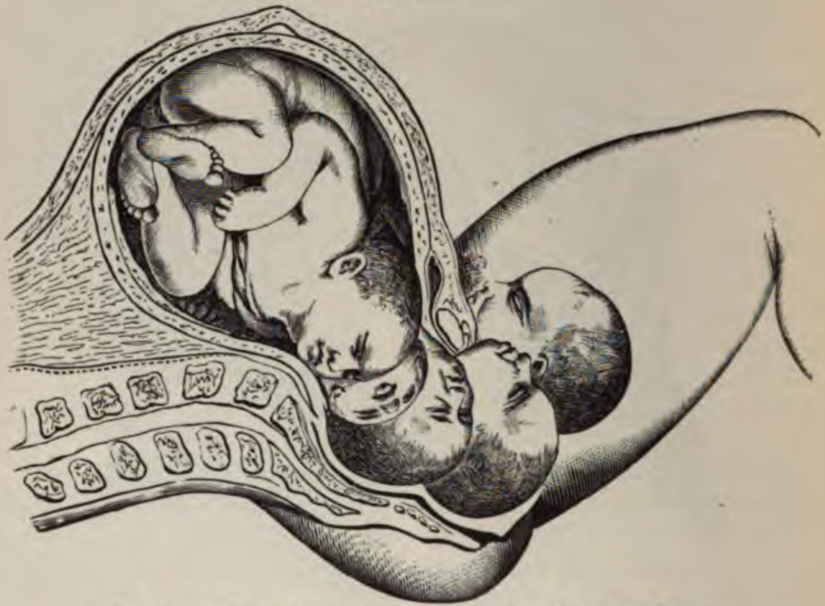
Face presentation, extension and descent. (Tarnier and Chantreuil, l. c.)

symphysis pubis until the neck presses against the arch and the nose, eyes, forehead, and vertex rolling over the perineum.

When the head is born, an *external rotation* takes place just as in vertex presentation and for the same reason, the shoulders going through a rotation similar to that to which the head was subjected. By this external rotation the chin is moved in the direction which it came from.

In the second position the mechanism is exactly the same, with the exception that the forehead at first points to the right instead of the left, and the chin rotates forward in the left side of the pelvis. In the third and fourth positions the chin is already turned forward from the beginning, and the internal rotation is therefore much less marked.

FIG. 284.

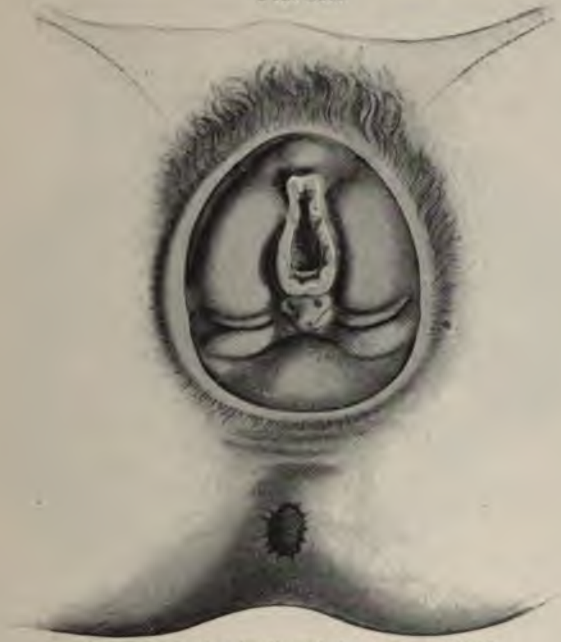


Face presentation, rotation and flexion. (Tarnier and Chantreuil, l. c.)

Diagnosis.—By external palpation the occiput is felt above the superior strait and between the skull and the back is felt a deep hollow. The heart-sounds are heard more distinctly through the chest of the fœtus pressing against the uterine wall than through the remote back. In the beginning the diagnosis of face presentations by means of vaginal examination may be difficult, the examining finger impinging on the forehead, which may be mistaken for the vertex. Later the diagnosis becomes very easy. We then feel the forehead, the orbits with the eyes, the nose with the nostrils, the mouth with the hard alveolar ridges, and the chin. When the face becomes much swollen, it may, however, be mistaken for the breech, the cheeks being taken for the nates, the nose for the genitals, and the mouth for the anus (Fig. 285); but the diagnosis can always be made by the presence of the alveolar ridges inside of the mouth, to which nothing corresponds in the rectum, and the hard orbital edges surrounding the soft globular eyes.

In palpating the nose attention should be paid to the direction of the nostrils, as they point in the direction of the chin, the position of which is of so great importance.

FIG. 285.

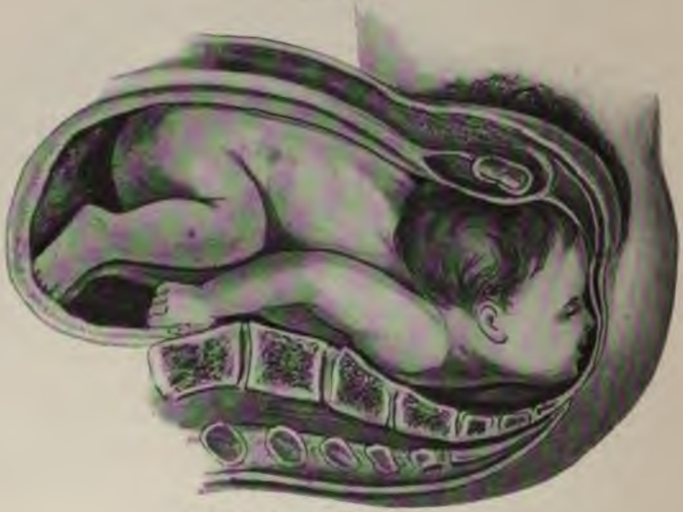


Face presentation in distended vulva. (Ahlfeld.)

Persistent Mentoposterior Position.—Sometimes the chin does not rotate forward until the face has descended so low down that it presses on the pelvic floor. In rare cases it does not rotate forward at all, and then we have to deal with one of the most difficult situations in obstetrics. Rarely nature alone can end labor under these circumstances, and it is only possible if the head is exceptionally small or the pelvis exceptionally large, since the occiput and the chest have to pass at once through the pelvis (Fig. 286). If the child is born in this position the forehead and the large fontanelle come into view under the pubic arch. This part of the skull is pressed tightly against the arch, and the face rolls over the perineum until the chin gets free of its edge, and the occiput comes down in front. More rarely the forehead is pressed against the anterior wall of the pelvis, the eyes and the nose become visible, the mouth and chin roll over the perineum, and finally the forehead, vertex, and occiput get clear of the pubic arch. In cases of persistent mentoposterior positions the mentofrontal diameter descends through the oblique diameter of the outlet, the soft parts at the sacrosciatic notch yielding a quarter of an inch.

Prognosis.—For the mother the prognosis in face presentations is fairly good, but the labor is, as a rule, protracted and painful. Uterine inertia may set in and the patient become exhausted. For the child the danger is much more serious. While the infantile mortality in vertex presentation is only 5 per cent., in face presentations it reaches 13 per cent. In persistent mentoposterior positions there is hardly any chance of delivering a living child. The cause of this great mortality is to be sought in the compression of the jugular veins of the neck and the consequent congestion of the brain. The third and fourth positions are comparatively favorable, because in them the chin is turned forward from the beginning.

FIG. 286.



Persistent mentoposterior position.

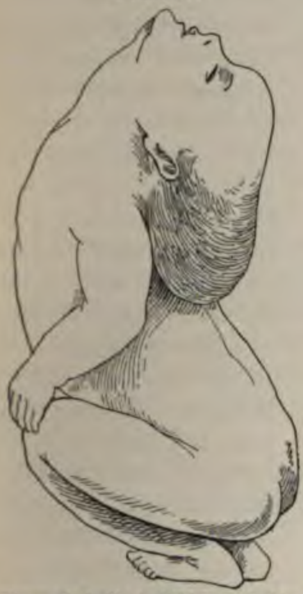
Effect on the Shape of the Child.—The serosanguineous swelling known as caput succedaneum (Fig. 216, p. 178) begins in face presentations at the anterior angle of the mouth and extends over the cheek, the malar bone, and may even pass over on the other half of the face. It has a dark-blue color and is so disfiguring that the accoucheur should prepare the bystanders for it, and should not let the mother see the child until the swelling has subsided, which it does in the course of a few days.

The skull becomes much compressed in its perpendicular diameters, and the occiput much elongated (Fig. 287).

This peculiar conformation also, as a rule, disappears in a few days, but may last for weeks, and perhaps even cause a permanent dolichocephalia.

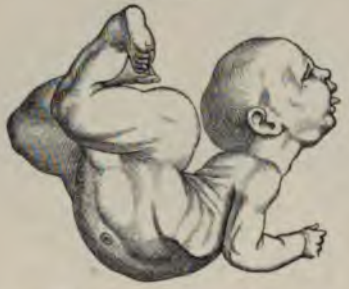
After difficult deliveries in face presentation the whole body of the child may for days have a peculiar opisthotonic shape. Howsoever the child is placed, it extends its occiput against the back and brings the lower part of the body up against the head (Fig. 288).

FIG. 287.



Shape of skull of child born in face presentation. (Charpentier.)

FIG. 288.



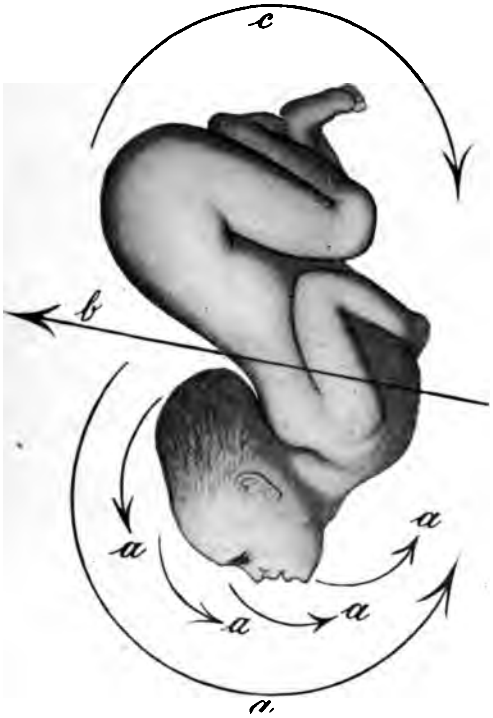
Attitude of child born in face presentation. (Olshausen-Veit.)

Treatment.—Since in the great majority of cases nature can finish labor, and the accoucheur risks to do more harm than good, he should, if the case is seen early and the dimensions of the child and the pelvis are satisfactory, first of all await developments. If the pelvis is flat, he had better resort to podalic version and extraction as soon as the os is fully dilated and before the head becomes impacted. If the pelvis is generally contracted, the face presentation should early be changed to a vertex presentation.

If after the rupture of the membranes labor does not progress favorably, an attempt should likewise be made to change the face presentation into a vertex presentation by *Thorn's method*, which simultaneously attacks the head and the body of the fœtus by internal and external manipulations. For this purpose the patient is placed on the side on which the chin is. Pressure is exerted upward on the hard parts of the face with a view of dislodging the chin upward. The occiput is pulled down manually. With the other hand pressure is made on the bulging chest, and simultaneously the breech is pushed forward and to the opposite side (Fig. 289).

Version may also be resorted to at any time when the condition of the mother or the child is such that a speedy delivery becomes necessary, or in cases of persistent mentoposterior position; and to be of any use, it must be performed before the head is so impacted that it cannot be moved.

FIG. 289.



Thorn's method of changing a face into a vertex presentation. The arrows *a a* show how pressure is made from the vagina against the chin, the malar bones, and the forehead and the occiput is pulled down; *b* shows the direction of pressure against the chest; *c* shows the direction in which the breech is moved.

The forceps may be used late in labor when the chin is rotated under the pubic arch, and then traction should be made downward and forward, so as to drag the occiput over the perineum.

If the chin remains behind, a cautious attempt may be made to turn it forward by inserting a finger into the mouth or by pressing on the side of the forehead; or we may try to rotate the head by means of the forceps, preferably a straight one, as this moves more freely in the pelvis than the curved one. If in spite of all efforts the chin remains behind, we may try to deliver the head in this direction by pulling the chin over the perineum. If that also proves impossible, craniotomy should be performed. Even if the child is still alive, we know that it is doomed, and may therefore without hesitation sacrifice it in the interest of the mother. The perforation may be made through an orbit or the hard palate.

§ 5. **Brow Presentation.**—Sometimes the extension by which a vertex presentation is changed into a face presentation is arrested halfway, the result being that the forehead presents itself at the superior strait. This is a still worse presentation than a face presentation, for if the head should go down in this position it would have to pass the pelvis with the long occipitomental diameter, which is longer than the pelvic diameters.

Mechanism of Labor.—In the beginning the frontal suture lies in the transverse diameter of the pelvis. During the progress of labor the forehead, as a rule, turns forward and the occiput backward. The superior maxillary bone is pressed against the pubic arch. In the vulva appears first the forehead, then the eyes, and thereafter the vertex and occiput roll over the perineum. Last of all the superior maxilla, the mouth, and the chin emerge under the pubic arch.

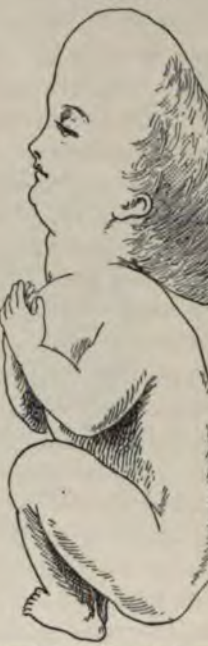
But in some cases this rotation forward of the forehead does not take place, the head remaining in the transverse diameter. In such cases the face, except the lower jaw, appears under one side of the pubic arch, and the occiput under the other, and at last the lower jaw is born.

Diagnosis.—The diagnosis is easy. The examining finger feels the forehead occupying the brim, the large fontanelle on one side and the bridge of the nose and one orbit at the other.

Prognosis.—The prognosis for the mother is in so far serious as the labor is very tedious, her strength may give out or operations become necessary to deliver her. For the child it is much worse, half of the children being lost.

The Shape of the Child's Head.—The caput succedaneum forms on the brow, and the skull itself is drawn out in this direction and in that of the occiput, whereas it is compressed in the mentobregmatic diameter (Fig. 290).

FIG. 290.



Head of child born in brow presentation. (Charpentier.)

Treatment.—Childbirth in brow presentation being beset with such grave difficulties, the treatment must be an active one. In the beginning of labor we may by pressure on the presenting part try to change the brow presentation into a vertex presentation, which often is possible. The next best thing is to change it by similar means into a face presentation. If neither of these attempts succeed and the soft parts are sufficiently dilated, it is best to perform podalic version. If the head is too low down for that, we may apply the forceps and pull well down at first until the superior maxilla touches the pubic arch. Then we reverse the direction and pull forward in order to make the vertex roll over the perineum.

If we again fail, nothing is left but craniotomy. To this we have recourse as soon as the child dies, but even when it is living the operation is indicated, since the child is lost anyhow and the mother must be delivered. Those who are absolutely opposed to sacrificing fetal life might in brow presentations and bad face presentations try symphyseotomy. It is not unlikely that the gain in room, which sometimes is quite considerable, would allow a correction of the position or give better chances for the forceps operation.

§ 6. **Pelvic Presentation.**—When any part of the lower extremities of the fœtus presents itself at the superior strait of the pelvis, it is called a pelvic presentation. The breech alone may be found at the entrance to the pelvic cavity (Fig. 108, p. 78) or the breech together with one or both feet. This is called a *breech presentation.* Or one or both feet alone may occupy the lower pole of the ovum, which is called a *foot presentation* or *footling presentation* (Fig. 110, p. 80). Or one or both knees may be there instead (Fig. 109, p. 79), a *knee presentation.* The latter is extremely rare, and we can realize that it must be so, when we see how the fœtus has to undergo partial extension and the uterus becomes much stretched.

Frequency.—As pelvic-end presentations are likely to give some trouble, they have a tendency to gravitate towards lying-in asylums, in which they occur in about three per cent. of labors, while in private practice they are not more than about one-half as common.

Positions.—In pelvic-end presentations we may distinguish four positions, corresponding to the four vertex positions, the sacrum occupying the place of the occiput.

In the *first position*, or *left sacro-anterior position*, L. S. A., the sacrum is turned forward to the left in the direction of the iliopectineal eminence or the foramen ovale.

In the *second position*, the *right sacro-anterior position*, R. S. A., the sacrum is turned to the right iliopectineal eminence or foramen ovale.

In the *third position*, or *right sacroposterior position*, R. S. P., the sacrum of the fœtus is found in front of the right iliosacral joint of the mother.

In the *fourth position*, the *left sacroposterior position*, L. S. P., the fetal sacrum is found at the left iliosacral articulation.

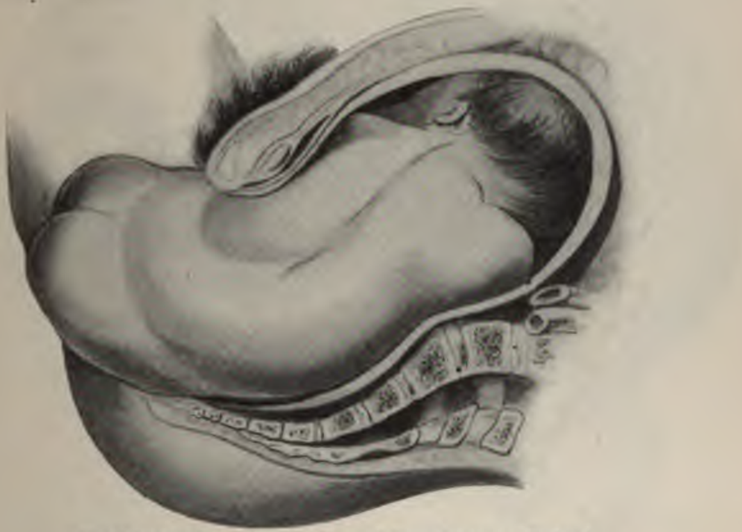
Of these positions the first and third are the most common, for the same reasons that the head in vertex presentation usually occupies the left oblique diameter. But in the course of labor the sacrum nearly always turns forward, so that labor ends in the first or the second position.

If breech and feet are together, they form so broad a base that they stay above the brim and no engagement takes place during pregnancy.

Etiology.—During pregnancy the presentation of the fœtus changes quite frequently, and, since at the same time the fœtus grows, it may, so to say, be caught while the breech is turned down, and become too large for a return to the vertex presentation. Some women will have a pelvic presentation in every pregnancy, which seems to prove that there is some peculiarity in the shape of their uterus which favors this presentation. It is more common in multiparous women than in primiparous, probably on account of a less perfect shape of the uterus. It is also more frequent in twin pregnancies, which is explained by the necessity of one child adapting itself to the other.

Mechanism of Labor.—When labor begins, we first have a *descent* with the transverse diameter of the breech in the oblique diameter of the pelvis, the anterior hip, as a rule, descending a little lower than the posterior. The breech being less well fit to dilate the cervical canal and the vagina than the head, this descent is liable to be slow. Then follows a *rotation* forward by which the anterior hip is brought under the centre of the pubic arch.

FIG. 291.



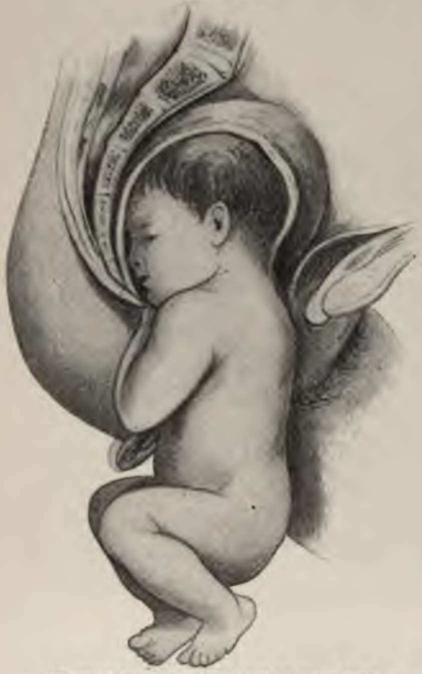
Lateral flexion of fetal body in breech presentation. (Hodge.)

Simultaneously with this descent and rotation a strong lateral *flexion* takes place, the body of the fœtus being bent with the concavity towards the pubic arch (Fig. 291). The anterior hip is born first and soon followed by the posterior.

Sometimes this rotation of the hips is more or less imperfect, so that the hips are born in the oblique diameter or somewhere between that and the anteroposterior. Soon the lower extremities become free, the feet coming out before the legs. The arms, as a rule, remain pressed against the thorax. The elbows show first in the vulva, and the rest of the arms and hands follow. When the time comes for the shoulders to be delivered, there is again a little rotation forward under the pubic arch, the anterior shoulder being born first, and soon followed by the posterior rolling over the perineum. By this time the longitudinal diameters of the head are in or near the transverse diameter of the pelvis, and next the occiput is rotated forward. The nape of the neck is pressed against the pubic arch, and finally the chin, face, vertex, and occiput appear at the perineum (Fig. 292).

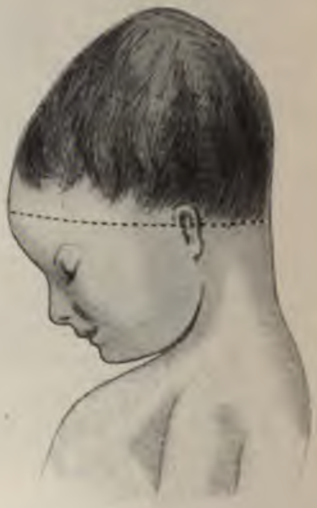
During this whole progression through the pelvis the chin remains pressed against the chest (Fig. 293), which favorable flexion is started by pressure being exercised through the spinal column up against the head, which forms a two-armed lever. The distance from the foramen magnum to the tip of the occiput being shorter than that from the foramen magnum to the chin, the occiput rises and the chin descends until it reaches the sternum.

Fig. 292.



Normal birth of the head in pelvic-end presentations.

Fig. 293.



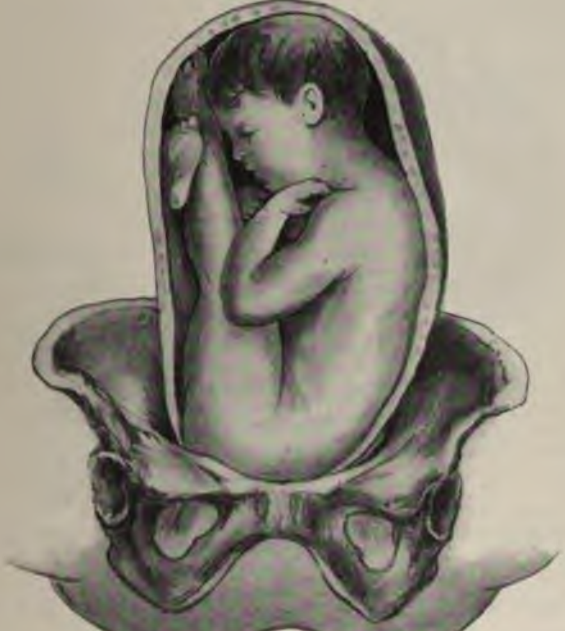
Flexion of head in pelvic-end presentation. (Zweifel.)

In exceptional cases there are deviations from this regular mechanism: the legs, instead of being bent at the knees, may be extended in front of the anterior surface of the fœtus (Fig. 294), or the arms may become extended on the sides of the head, or the occiput may remain in the posterior part of the pelvis.

When the extremities are extended upward, artificial aid becomes necessary to accomplish delivery. The extension upward of the arms is mostly due to attempts to pull out the child by the legs.

When the occiput remains posteriorly in the pelvis, the delivery becomes much more difficult than when it rotates under the pubic arch. In these cases, as a rule, the face is pushed down under the pubic arch, and at last the occiput rolls over the perineum. But in a few cases another mechanism has been observed. The chin becomes jammed above the symphysis, the face turns upward, the occiput rolls first over the perineum, and is followed by the vertex and the face (Fig. 295).

FIG. 294.



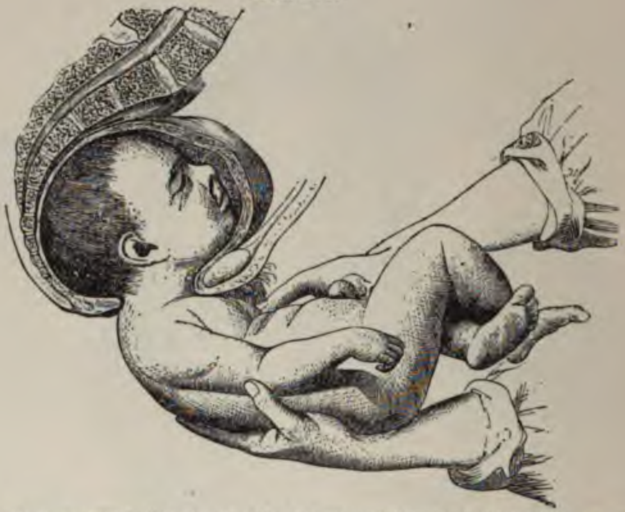
Legs extended in front of the anterior surface of the fœtus in breech presentation.

The mechanism in foot and knee presentations is the same as in breech presentation.

Prognosis.—With proper treatment, or rather if harmful interference is abstained from, the prognosis of pelvic presentations is, so far as the mother is concerned, as good as that of vertex presentation. At most the opening stage may be somewhat protracted.

It is very different in regard to the child, the infantile mortality being about twenty per cent. The chief cause of this is that the umbilical cord becomes compressed between the after-coming head and the pelvic wall, whereby the fetal respiration is arrested. The child may endure a short compression of the cord, but if this continues more than 8 or 9 minutes the child dies, and often it succumbs even earlier. Another cause of death may be the premature detachment of the placenta, when the larger part of the body is born and the head still is retained in the uterine cavity. It may be also that the placenta becomes compressed between the hard head and the contracting uterine wall, and that thereby the circulation in it is interfered with.

FIG. 295.



Irregular disengagement of head in pelvic-end presentation, chin hitched over symphysis. (Charpentier.)

Footling presentations are worse than breech presentations, because the legs are less fit to expand the genital canal, while in breech presentation the passage of the after-coming head is much facilitated.

Irregularities in the mechanism, such as the extension of the legs in front of the fœtus, the extension of the arms up by the sides of the head, and persistent occipitoposterior positions, make the prognosis much less favorable than it is in normal breech cases.

Diagnosis.—By external palpation one can in most cases feel the hard round fetal head at the epigastrium or the hypochondrium. The pelvic end of the fœtus below is less globular, smaller, and softer than the head. The heart sounds are, as a rule, most distinct above the level of the umbilicus. By vaginal examination the diagnosis early in labor is quite difficult or impossible. Maybe all we feel is a bag of water with a movable small part, which slides away and cannot be recognized as a foot or a hand. The mere fact that the pelvic cavity is empty must awaken the suspicion that we have to deal with a pelvic presentation. The bag of waters in a footling presentation is apt to be narrower, more finger-like than when the broad head presents. When the membranes rupture, the liquor amnii is apt to pour out in a rush, since the pelvic end, and especially the feet, adapts itself less well to the os than the globular head, which acts like a ball-and-socket valve.

When the bag of waters is broken and the presenting part within reach, the diagnosis becomes very easy. We then feel the little hard movable coccyx, which is entirely characteristic. So is likewise the hard projecting ridge formed by the sacral crest. By either of these points we ascertain not only the presentation, but the position as well. We feel also the tubera of the ischia, and midway between them a groove. In this we may, near the tip of the coccyx, feel the anus, which, if the child is dead, is open, and, if it is alive, in most cases can be opened by pressing a finger against it. In withdrawing the finger we find it soiled with meconium. In that groove we may farther away from the coccyx feel the large soft scrotum and the cylindrical movable penis. The female genitals are not so easily recognized, and the male ones may be beyond reach. Unless the male organs are felt, it is, therefore, not safe to predict the sex of the child.

The breech has been taken for the face, but the movable coccyx, the sharp crest of the sacrum, and the absence of alveolar ridges inside the anus are more than sufficient to avoid such a mistake.

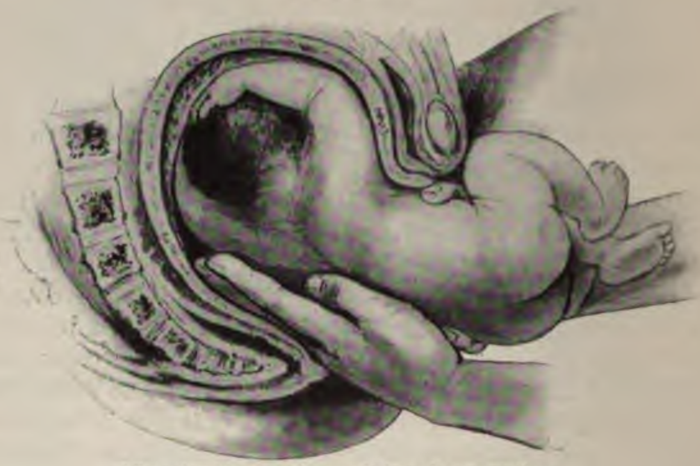
Meconium may be expelled when the child is in head presentation, but then it becomes mixed with and tinges the whole mass of the liquor amnii, while in pelvic presentation it may be expelled and found in the vagina as the well-known black, thick, sticky mass.

When a small part is within reach, it is of the greatest practical importance to distinguish between a hand and a foot, as the former means a shoulder presentation, which demands a treatment entirely different from that of a pelvic presentation. A foot is long and narrow, has a round projecting heel, the inner edge is much thicker than the outer, and the toes form a straight line slanting down from the big toe to the little one. The big toe cannot be opposed to the others. The foot forms a right angle with the leg, and cannot be stretched out in line with it. In every one of these respects it differs from a hand, which is shorter and broader, has edges of the same thickness, has no projection behind, and can easily be stretched in the line of the forearm. The tips of the fingers form a circular line, the middle projecting ahead of the others, and the thumb is easily apposed to every one of the four fingers. The hand will sometimes grasp the examining finger, which the foot cannot do.

We can not only distinguish a foot from a hand, but we may even diagnosticate the right from the left foot. For this purpose we superpose in imagination our own foot over that of the fœtus, heel above heel, toes above toes, and sole above instep.

A knee has so peculiar a shape that nothing is like it. It forms a large round hard mass with a central depression between two projections. An elbow is smaller, and has a central projection, the olecranon, with a depression on either side, outside of which there is a smaller projection—the condyles of the humerus. The heel is also small, hard, round, with a single tuberosity. The shoulder is more rounded than a knee, and has only one prominence, formed by the acromion, from which the clavicle may be felt starting.

FIG. 296.

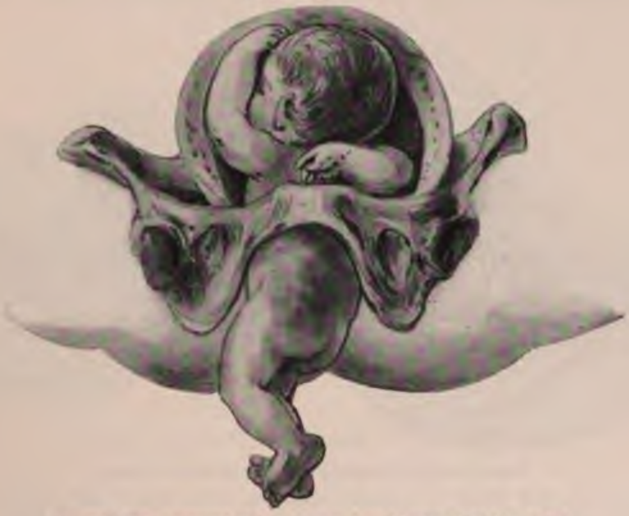


Liberating the posterior arm in breech presentation.

Treatment.—It is of the greatest importance not to pull on the legs, by which we cause extension of the arms alongside the head and remove the chin from the chest. The accoucheur should even carefully preserve the water-bag, in order to insure as good a dilatation of the genital canal as possible, and he should leave the case strictly to nature until the child is born as far as the umbilicus. Then he must be on the alert. He should, if possible, pull the umbilical cord down in a loop, place it in a corner of the pelvis in front of one of the sacro-iliac joints, where it is best sheltered against pressure, and constantly feel the pulsation in it. As long as this is strong and regular, there is no danger, and no interference is called for. If it becomes weak or irregular, the life of the fœtus is in danger, and all must be done to finish labor as rapidly as possible. The best thing to do is to seize the fundus uteri and exert pressure on the head from above during a contraction.

If the arms extend on the sides of the head, they must be liberated. For this purpose the thumb and first two fingers are slid along the arm from the shoulder to the elbow. When this is reached, it is easy to bend it and get it down in front of the face (Fig. 296). As a rule, it is best to liberate the posterior arm first, because here are softer parts, and consequently more room can be obtained than in front at the pubic arch. In order to get access to the posterior arm, the child's body should be turned up over the mother's abdomen, and when that arm is born the body is pulled back over the mother's perineum, which approaches the anterior arm to the accoucheur's fingers.

Fig. 297.



Dorsal displacement of one arm across the neck of the child.

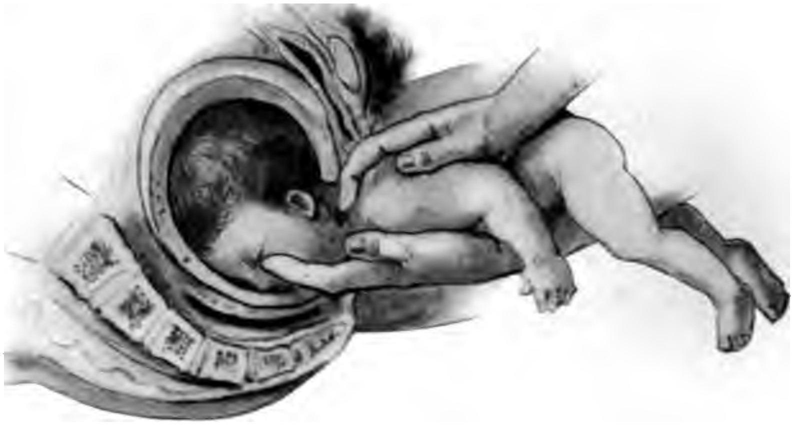
If the anterior arm cannot be liberated in this way, it is well to rotate the fœtus, so as to move the anterior shoulder backward. This may be done either by seizing the fetal trunk, pushing it upward, and rotating it, or by pulling the already liberated arm forward under the pubic arch.

It may happen that the anterior arm falls behind the neck of the child (Fig. 297), so as to form a cross-bar above the inlet. By pressing the fetal body upward and rotating it in the direction of the hand the arm sometimes gets clear of the occiput.

If it does not, the accoucheur should try to turn the anterior shoulder back by rotating the body, pulling on the released posterior arm or on the elbow of the displaced arm, while the body is brought well back over the perineum in order to obtain more room. If the arm cannot be dislodged, and the child's life is in danger, it is proper to pull down, even with the risk of fracturing the humerus. If this happens, it should be placed between an anterior and a posterior padded felt splint and fastened with bent elbow to the thorax, when the fracture will heal in the course of two or three weeks.

Whenever we try to rotate the shoulder by acting on the body, we must bear in mind that the occipito-atlantic articulation admits only a lateral rotation of a quarter of a circle. We should, therefore, by vaginal examination make sure that the head follows the rotation imparted to the shoulders, as otherwise the cervical vertebræ would break and the spinal cord become compressed.

FIG. 298.



Smellie's method of delivering after-coming head.

Next, the head must be delivered, and in so doing we must remember the importance of having it strongly flexed. This may be accomplished in different ways: we may press down on the vertex through the abdominal wall, we may press on the forehead from the rectum, or we may place two fingers on the upper maxilla in the vagina and press it down (*Smellie's method*, Fig. 298).

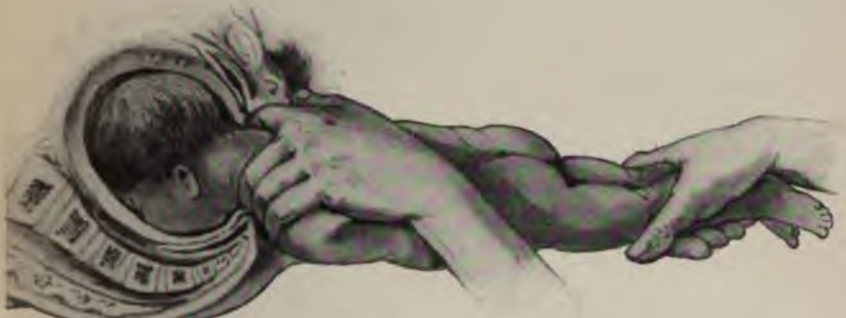
A very effective way is to insert the right index-finger into the mouth and draw the chin down while the fingers of the other hand pull on the shoulders (*Levret's method*).

If the head is still above the brim, it may be delivered by pulling downward and backward on the legs with the right hand and on the shoulders with the left hand until the head is in the cavity (Fig. 299), when the legs are suddenly carried away up over the woman's abdomen (Fig. 300). In this way a fulcrum is obtained under the pubic arch, against which presses the nape of the neck, and the chin, vertex, and occiput are successively carried over the perineum. This is an old French invention, the *Puzos method*, much used by modern accoucheurs in Prague, and therefore known as the *Prague method.*

Very exceptionally the forceps may be applied to the after-coming head. It takes more time, and, as a rule, the manipulations just mentioned suffice.

In the delivery of the upper half of the body in pelvic presentations, the life of the child is often endangered, and unless the accoucheur succeeds rapidly in delivering the arms and the head, the child's life is lost. He should therefore be familiar with the different methods of delivery, so as to be able to pass promptly from one to another if the first does not succeed. The personal experience of the writer with the after-coming head is, however, in favor of pressure on the head through the abdomen by an assistant, combined with the pull on the shoulders and lower maxilla.

FIG. 299.



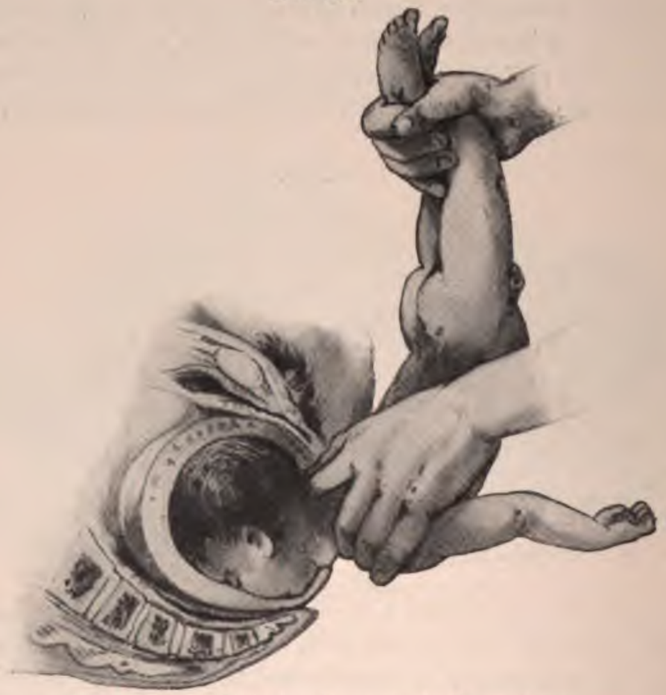
Prague method of delivering after-coming head, first step.

The application of the forceps to the after-coming head may be difficult, especially if there is a spastic contraction of the lower uterine segment or when the face is turned laterally in the pelvis. The instrument may hitch against the chin or the nose, which should be protected by inserting the guiding hand deeply. The forceps should be applied below the body of the child, so as to have room to bring the handles down. The trunk and extremities of the child, wrapped up in warm flannel, should be held by an assistant. Special attention should be paid to the navel-cord, so as to avoid compressing it with the forceps.

In sacroposterior positions of the breech we may favor rotation by hooking the index-finger in the anterior or both groins.

If the head remains in the occipitoposterior position, we may facilitate rotation by pressing the anterior temple backward. If the head does not yield, we must try to imitate the natural mechanism by pushing the occiput up and pulling the body well back in order to draw the face down under the pubic arch. If that too fails and the chin is hitched over the symphysis pubis, an attempt should be made, by pulling well forward, to deliver the occiput over the perineum, when the remainder of the head will follow.

FIG. 300.

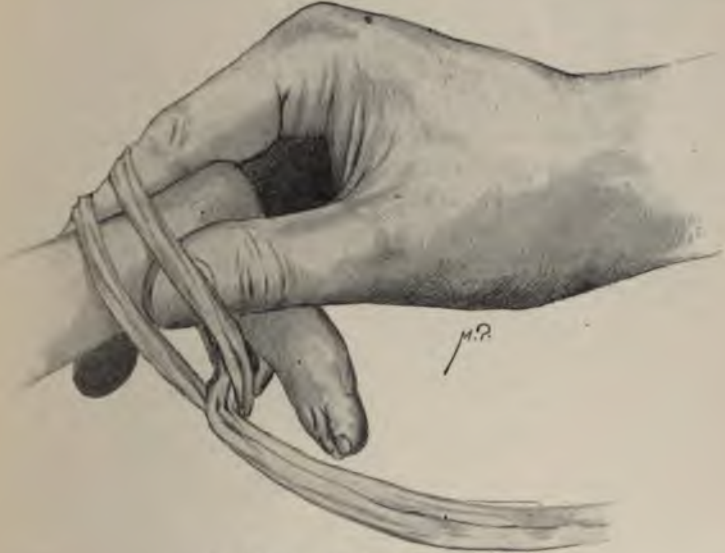


Prague method of delivering after-coming head, second step.

If the breech becomes impacted in the pelvic cavity, three methods of overcoming the difficulty are at our command: to bring down one or both legs, to pull on the groin, or to apply the forceps. If the breech can be raised sufficiently to make room for the hand or arm, the first method is the best. If the feet, as usual, are found near the breech, this is even not difficult; but if the legs are extended in front of the fœtus, it is necessary to go all the way up to the fundus in order to get hold of the feet and break up the wedge formed by the fœtus; or we must at least reach beyond the knees, when perhaps we may be able to bend them and thus bring the foot nearer.

If the accoucheur wants to bring down a foot he seizes it between the index and middle finger above the ankles and the thumb on the sole. (See VERSION, Fig. 455.) As it is quite slippery, he may have some difficulty in holding it. Then a good grip may be obtained by carrying a fillet around the foot above the ankles. I use tape a quarter of an inch wide. First a slip-knot is made, which, with a little practice, can be done with one hand. The loop is carried on the thumb and first two fingers (Figs. 458, 459, 460), and pushed over the foot with the fingers of the other hand (Fig. 301), which thereafter pulls the slip-knot tight.

FIG. 301.



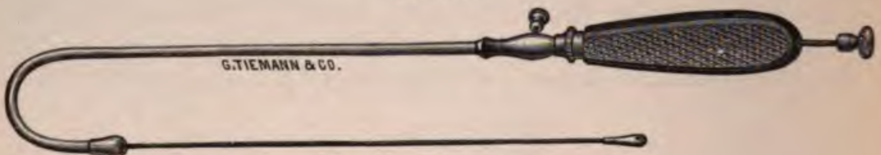
Mode of passing fillet over foot.

If the breech is so low down as to fill the pelvic cavity and prevent us from passing the hand and arm, we should try to hook the index-finger into the groins of the fœtus, or at least into the anterior groin, until we can get hold of both and pull the breech down. But if the breech sticks high up we have a rather weak grip on it in this way, and our power is very much increased if we can pass a fillet over the anterior groin. In our aseptic times the accoucheur can, however, no longer pull off his silk necktie and draw it over the groins with a copper wire, even if he can secure one, as we formerly did. A disinfected linen tape is good, and may be hauled into position by means of Olivier's fillet-carrier (Fig. 302).

The hard linen tape may, however, cut into the soft tissue at the groin. A better contrivance is to take lacing covered by rubber tubing, which is stitched to it.

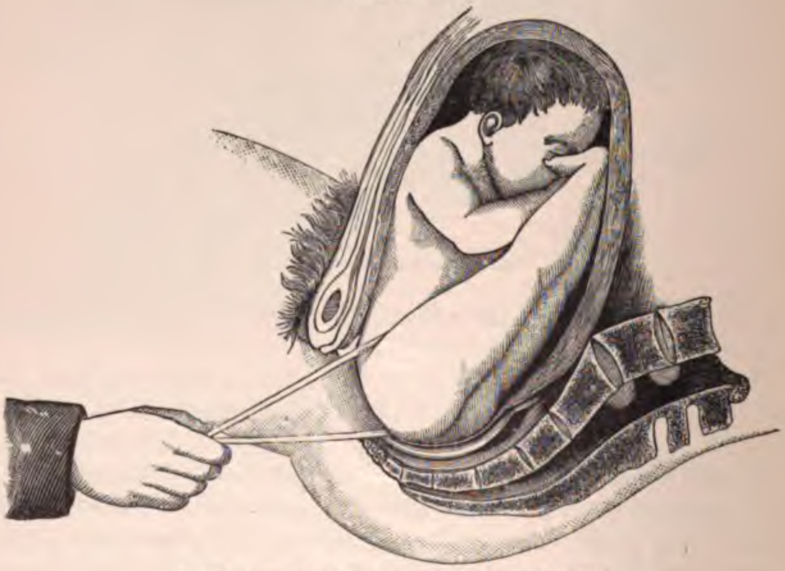
Olivier's fillet-carrier consists of a metal tube bent into a hook and provided with a handle. Through the tube runs a whalebone with a metal end perforated so as to form an eye. The hook is carried over the outer side of the anterior hip, and when its end lies between the thighs, the whalebone is pushed forward till it appears outside the vulva. Then the fillet is attached to the eye, and the whalebone withdrawn, and finally the hook is disengaged and withdrawn, carrying the fillet along (Fig. 303).

Fig. 302.



Olivier's fillet-carrier.

Fig. 303.

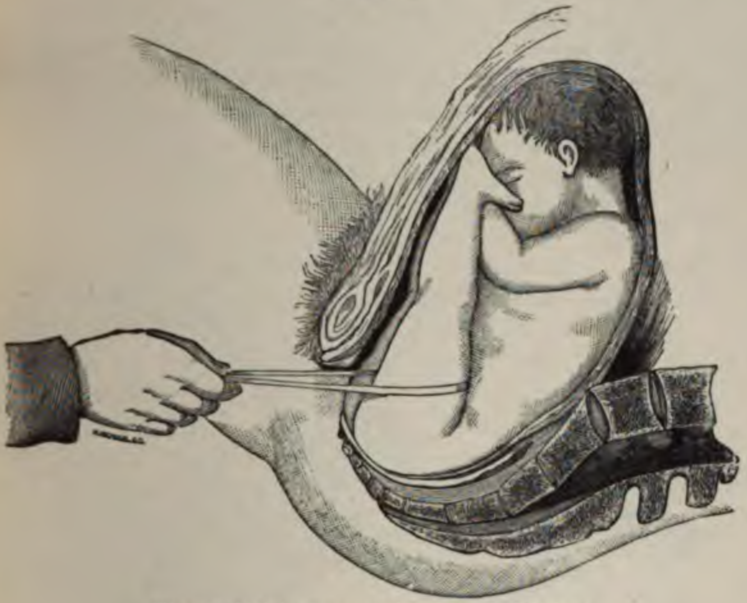


Fillet in groin in sacro-anterior position. (Olivier.)

If the fœtus is in sacroposterior position, there is danger of the fillet slipping forward on the thigh (Fig. 304). When traction is then made, we might fracture the femur. Care must therefore be taken to push the fillet well down to the groin, which may be facilitated by introducing a finger into the anus and pulling forward.

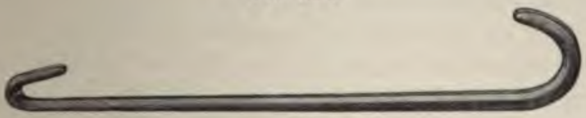
If no special instrument is at hand to carry the fillet around the groin with, it may be done with a flexible catheter. It is first introduced curved with the stylet all the way through. Next the stylet is partly withdrawn, which makes the tip dip down. When it has been pulled outside the vulva with the fingers or a pair of artery-forceps, the stylet is again pushed through as far as the eye. A silk thread attached to the fillet is passed around the stylet and tied, and then the stylet is pushed through to the end. If we now pull the catheter back, the string and the fillet must follow.

Fig. 304.



Fillet on thigh in sacroposterior position. (Olivier.)

Fig. 305.



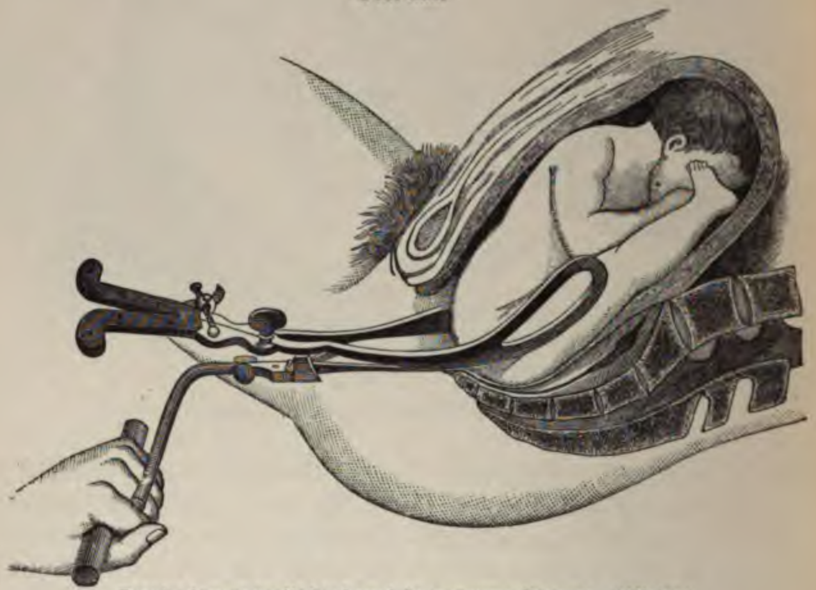
Blunt hook.

Instead of the soft fillet some pass a *blunt hook* over the groin (Fig. 305). It is passed like Ollivier's fillet-carrier, but is more apt to cause fracture of the thigh bone.

After the leg or legs have come out, they should be surrounded by a piece of gauze or muslin, which takes away the slipperiness, and in extracting the accoucheur should always take hold as near as possible to the genitals, first working on the feet, then on the knees, then on the hips, and finally on the thorax.

Although the forceps originally were designed only for application to the head, it may be used with advantage also on the breech. One blade should be applied over the sacrum and the other over the posterior surface of the thighs. If the breech, however, is in the transverse diameter, the blades should be applied to the outer surface of the thighs (Fig. 306). It is not advisable to apply them over the trochanters and the crests of the ilium, as in this position the forceps is apt to slip.

FIG. 306.



Tarnier forceps applied to breech in transverse diameter. (Olivier.)

If delivery is impossible, the fetal pelvis may be crushed and extracted with the cephalotribe, or, if that instrument is not available, the pelvis may be diminished with perforator and extracted with forceps. If the head is arrested and the child is dead, embryotomy may be performed through the spinal canal and the foramen magnum. When the brain matter is pressed out, the head becomes so much smaller that it can easily be extracted.

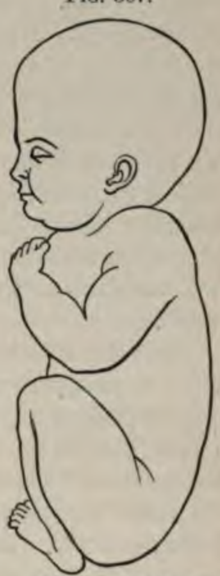
In breech deliveries the serosanguineous swelling is formed on the presenting part, ordinarily the anterior nates, and extends over the genitals, which may become much swollen.

The skull is compressed in the occipitofrontal diameter and bulges out at the top, so as to become brachycephalic and globular (Fig. 307).

§ 7. **Transverse Presentations.**—A transverse presentation, or *cross birth*, is the condition in which the long axis of the fœtus does not correspond to the long axis of the uterus, but is placed more or less transversely in the same. It is rarely found just at right angles to the long axis of the uterus, but slants more or less to one side, the head, as a rule, being on a lower level than the breech. Generally, nature does not suffice to accomplish delivery in these presentations. If no help can be obtained, outside of very exceptional cases, which will be considered presently, the woman dies undelivered.

We distinguish two positions in cross presentation: in the first, or *dorso-anterior*, the back of the child is turned forward against the abdominal wall (Fig. 112, p. 82). In the second, or *dorsoposterior* position, the back is turned backward against the vertebral column of the mother (Fig. 111, p. 81). Any part of the body, or a hand, elbow, or arm may present; but in the course of time the shoulder almost invariably becomes the lowest point, and therefore these presentations are also known as *shoulder presentations*. The head may be either in the left or the right iliac fossa, more frequently in the left, and the dorso-anterior position is about twice as common as the dorsoposterior. But all transverse positions are rare, occurring only in little more than one-half of one per cent. of labor cases.

FIG. 307.



The shape of the skull of the after-coming head. (Charpentier.)

The transverse presentation may be *primary* or *secondary*. During pregnancy it is not very rare, but as a rule the presentation in multiparæ is corrected to a vertex presentation by the contractions of the uterus. In other cases the primary transverse position continues, and in others again the presentation may at first be normal, and it is only during labor that the secondary transverse presentation is produced.

Etiology.—Transverse presentations are found much more frequently in multiparæ than in primiparæ, in whom both the uterine wall and the abdominal wall are much more resistant, and the uterine cavity has a more perfect form. In a primipara the transverse presentation is hardly found, unless she has a narrow pelvis. But some women doubtless have an abnormally shaped uterus, the ovoid lying transversely instead of perpendicularly. This is not anatomically proved, but we are driven to this conclusion by the fact that some women in every or nearly every labor have a transverse presentation. Great obliquity of the uterus may cause the presenting part to slide away, which may result in a transverse presentation. The most common cause is a narrow, especially a flat, pelvis, which prevents the head from being engaged. Tumors, uterine or others, may have a similar effect. Also a low attachment of the placenta, especially placenta prævia. The second twin is comparatively often found placed transversely. Hydramnion and a sudden escape of the liquor amnii or a fall may cause the displacement. It occurs particularly with small, dead, especially macerated, fœtuses.

Diagnosis.—The diagnosis is as a rule easy. By mere inspection we notice that the abdomen is unusually broad. By abdominal palpation we find that the transverse diameter of the uterus is longer than the longitudinal. As a rule, the hard, globular head is felt in one iliac fossa and the smaller and softer breech in the other side. Often we can also feel the cylindrical resistant back or the feet turned forward.

The heart-sounds are heard in the lower part of the abdomen, and are propagated most distinctly through the back of the fœtus.

By vaginal exploration executed early in labor we find the pelvis empty, and in the bag of waters we may feel a small, movable part, the nature of which cannot be recognized, or the back. Later, when the membranes rupture and the fœtus is pressed down, the diagnosis becomes easy. As a rule, we feel the shoulder, perhaps also the spine of the scapula or the collar-bone. The shoulder is a soft convex mass running out into a bony ridge, the acromion. It has been mistaken for the breech, but in breech presentations we have the second buttock, the groove with the anus and genitals, the movable coccyx, and the crest of the sacrum.

Sometimes we may feel the axilla and the ribs with intercostal spaces, which are not like anything else. The elbow is recognized by the large central projection formed by the olecranon and two smaller projections, one on either side—the condyles of the humerus.

By vaginal examination we can in this way make the diagnosis, not only of a transverse presentation; but, what is of great practical importance for the treatment, we can also decide in what position the fœtus lies. The shoulder-blade marks the back and the collar-bone the front. The lower angle of the scapula points in the direction of the feet. The axilla opens likewise in the direction of the feet. If an arm is prolapsed and we bring it into easy relation to the trunk, the back of the fœtus is on the same side as the back of the hand, the palm corresponds to the abdomen, the thumb points to the head, and the little finger to the feet. It is easy to make out whether we have to deal with the right or the left hand. For this purpose we need only to grasp the hand as in hand-shaking, the two thumbs being in contact. The fetal hand is then homonymous with that of the accoucheur. In studying obstetrics it is a great help to have a female pelvis, a fetal head, and a doll with movable joints. In this way all these descriptions of presentations and positions become quite plain.

If the hip presents, we may feel the groin, the anterior superior spine and the crest of the ilium. Rarely the back or the abdomen presents. The former is recognized by the spinous processes, the latter by the cord.

If the diagnosis cannot be made otherwise, it has been recommended to bring down the arm. This would hardly interfere with the measures to be taken subsequently, but it is better to avoid it.

Prognosis.—The prognosis as a whole is pretty bad.

The maternal mortality is about 11 per cent., and that among the children about 50 per cent., but it makes the greatest difference whether the case comes under treatment early or late, and whether the accoucheur acts intelligently or not. While a case seen before the membranes rupture, in all probability will end safely for mother and child, a neglected one may end in the loss of both.

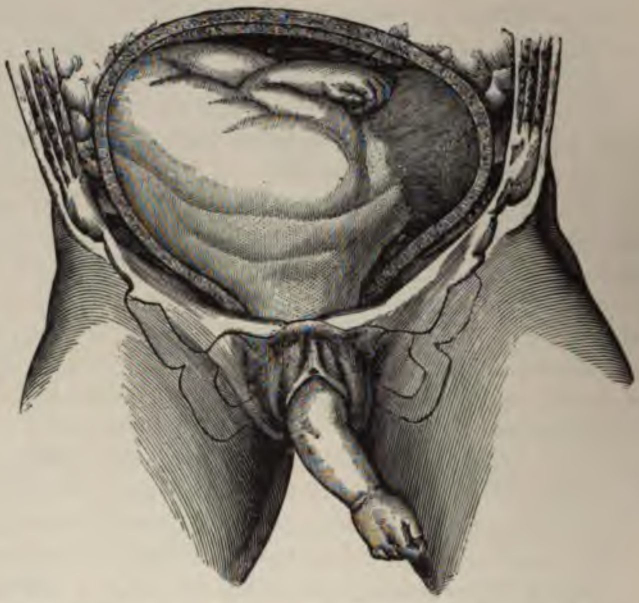
Course.—In transverse presentation the opening of the cervix and os is slow, there being no wedge to press on them as in longitudinal presentations. The bag during the interval between contraction hangs down as a narrower pouch than in head presentations. When the membranes rupture, the liquor amnii is apt to pour out in a gush, there being no part that adapts itself well enough to the cervix to retain the fluid. This gush of fluid may cause the prolapse of the umbilical cord or of an arm (Fig. 308). The upper part of the uterus may contract and press the presenting part with such force against the lower uterine segment that this may give way and the woman die from hemorrhage or peritonitis. Later the shoulder becomes jammed in the pelvis. The fetal body is flexed laterally, so that head and breech approach each other. The uterine contractions assume a tetanic character or die out. Microbes may enter the uterus and make it swell with gas—*tympania uteri, or physometra.* The woman may die from exhaustion or from sepsis.

There are two ways in which nature can accomplish delivery, spontaneous version or spontaneous evolution, but both are so dangerous that the accoucheur should never wait for them.

Spontaneous version consists in the substitution of one presenting part for another, and may end as a breech or head presentation. It can, as a rule, take place only before the rupture of the membranes or shortly after, but it has been observed even after the shoulder was in the pelvis or an arm had prolapsed. In Genesis, chap. xxxviii. 28–29, a case of twins is reported in which the midwife marked the prolapsed arm with a thread. The fœtus next withdrew this arm, and the other twin was born first.

Spontaneous evolution comes late in labor. In this mode of delivery the prolapsed arm remains outside, and the doubled-up body of the fœtus is pressed through the pelvis (Figs. 309–312). This is only possible if the pelvis is unusually large or the fœtus exceptionally small. Most of the children have been twins, immature or dead, but in a few cases living children have been born. The mechanism is twofold. In most cases the head remains in the large pelvis over the iliopectineal line. The shoulder turns forward and is pressed out under the pubic arch, and stays there till the child is born. The thorax is strongly curved and gradually pushed out. Next the hip rotates under the pubic arch and the legs are extended in front of the fœtus. When they have been expelled, the head is born together with the second arm, which is extended alongside of it.

FIG. 308.



Prolapse of arm in transverse presentation. (Tarnier and Chantreuil, l. c.)

In the other mechanism the head passes through the pelvis together with the thorax. First the shoulder is born, then the thorax and head together, and last the breech and lower extremities.

Treatment.—If the patient is seen during pregnancy, the head should be brought down over the brim of the pelvis by external ma-

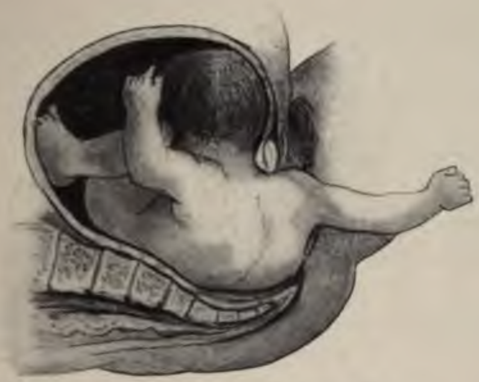


FIG. 309.—Spontaneous evolution, first stage.

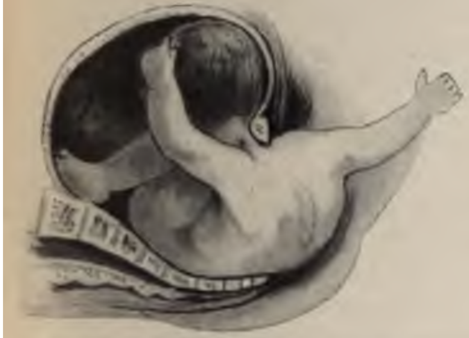


FIG. 310.—Spontaneous evolution, second stage.

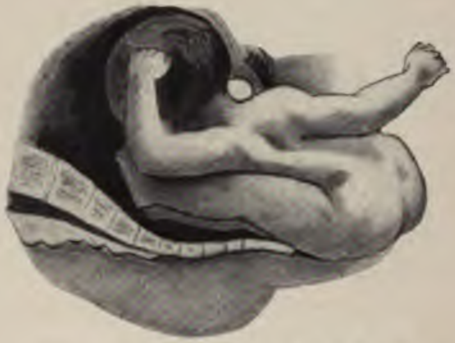


FIG. 311.—Spontaneous evolution, third stage.

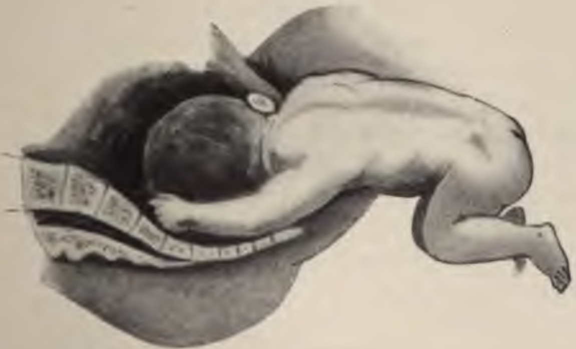


FIG. 312.—Spontaneous evolution, fourth stage.

nipulations and, if possible, kept there by the application of a tightly-fitting abdominal supporter. Where economy is an object, a flannel binder surrounding the whole abdomen and tightly pinned may be substituted for the work of the bandagist.

If the woman is taken in labor prematurely before the end of the sixth month of pregnancy, the case may be left to nature. Until that time the fœtus is so small and soft that it may be expelled by spontaneous evolution without harm to the mother, and it is not viable. After that period version is indicated.

In the beginning of labor external version bringing down the head over the brim of the pelvis is also indicated, and then the patient should lie on the side where the head was, for by so doing the fundus uteri is tilted over to this side and the head pushed in the opposite direction. The effect of this lateral posture may still be heightened by placing under the flank upon which the woman rests a bolster or a pillow rolled up so as to form a cylinder, and tied at both ends and in the middle. The writer has also succeeded in retaining the head below by keeping the patient on the back, and rolling two towels so as to form hard, sausage-shaped masses, one of which is placed on either side of the abdomen and held in place by a tight-fitting binder. The patient should under no circumstance lie on the side where the breech is, as this would favor deviation.

The membranes should be preserved as long as possible in order to obtain a good dilatation of the cervix and os which will facilitate further manipulations and the birth of the child. No examination should be made during uterine contraction, as then the membranes are more endangered. The membranes may be supported and dilatation furthered by placing a colpeurynter in the vagina.

If the membranes rupture before the os is fully dilated, it is advisable to try to perform version according to Braxton Hicks's method and bring down a leg. But perhaps the cervix can be artificially dilated, and then it is more expeditious, and therefore better, to insert the whole hand into the uterus, perform podalic version, and extract at once, and the same is to be done without awaiting full dilatation at any time when the mother's or the fœtus's life is in danger.

In cases that have been so neglected that all water has drained off, that the uterus is tetanically contracted around the fœtus, and that it is impossible to dislodge the shoulder, an attempt should be made to further spontaneous evolution by pulling on the presenting part.

If that, too, fails nothing is left but embryulcia or decapitation. (See OPERATIONS.)

§ 8. **Compound Presentation.**[1]—When an upper or a lower extremity presents beside the head, it is called a *compound* or *complex* presentation.

---

[1] Garrigues, "A Case of Presentation of the Head, Hand, Foot, and Cord," New York Med. Jour., June 16, 1883, vol. xxxviii., No. 24, p. 650.

A. *Upper Extremity.*—It is by no means rare that a hand is felt behind the presenting head, but generally it is withdrawn, or, if it stays, it is without importance, since the hand allows the head to pass. No interference is called for.

The presence of an arm is much more serious, since there may not be room enough for both head and arm to pass together through the pelvis. If it is the posterior arm that accompanies the head, the chances are better, for there is more room behind; but the anterior arm may prevent the internal rotation of the head and make the head remain in the transverse diameter of the pelvis or drive the occiput back into the hollow of the sacrum.

Sometimes a rotation takes place by which the anterior arm becomes the posterior.

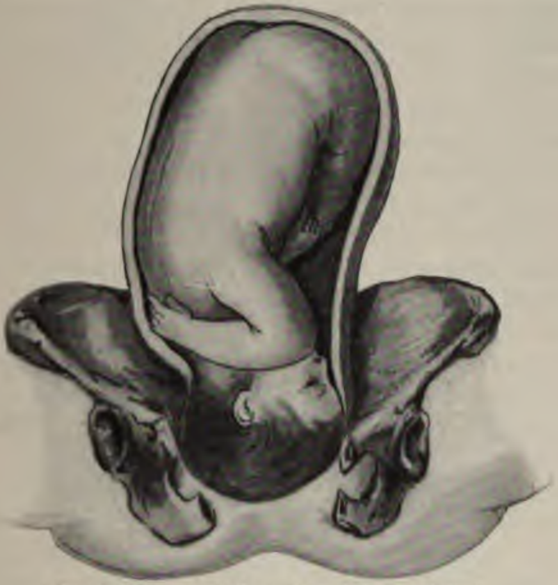
If the case is seen before the membranes rupture, the accoucheur should try to push the arm up cautiously without rupturing the membranes, and then press on the head from above, in order to make it engage. The patient ought to be placed on the side opposite to that where the arm is. If the membranes are ruptured, he should still try to move the prolapsed arm upward in front of the face, which he often can do with the thumb and two fingers, and when there is no longer room for the thumb, he uses the two fingers alone. In face presentations the arm is pushed over the chin and chest.

If the arm cannot be replaced, and the uterine contractions are not strong enough to bring the head down beside the arm, traction should be made on the head with the forceps, or if the child is dead craniotomy should be performed.

In rare cases the arm lies across and behind the neck (Fig. 313), forming a bar which hitches on the brim of the pelvis and prevents the head from advancing. This condition may be surmised if progress of labor stops, although there is no visible obstruction. The diagnosis can only be made by anæsthetizing the patient and pushing the hand sufficiently deep in to feel the obstacle. As soon as the nature of the case is ascertained, the accoucheur should seize the forearm and try to bring it down, changing the condition into an ordinary head-and-arm case, and if he does not succeed in this attempt, he should perform podalic version and extract.

B. *Lower Extremity.*—One or both feet may present with the head and descend with it, but this is a rare occurrence, which happens mostly when the fœtus is immature or dead. First we try to replace the extremity, and, if that is not feasible, podalic version should be performed. But to pull on the prolapsed leg only increases the difficulties. As the leg is drawn down, the fœtus becomes more and more bent to one side and the head does not move. But by bringing down the other leg and pulling on that we make the fœtus rotate on its long axis, the extremities which are jammed together with the head in the pelvis are raised, the bent side becomes straightened out, and, finally, the head recedes from the pelvis, and is delivered as described in treating of pelvic presentations.

Fig. 313.



Dorsal displacement of arm in vertex presentation.

If the fœtus is dead and impacted, the head should be perforated and extracted with forceps. If the fœtus is small and freely movable, it may be turned and extracted.

CHAPTER IV.

EXCESSIVE SIZE OF FŒTUS.

The fœtus may be of unusual size, either in general or in particular parts of the body.

§ 1. **Giant Children.**—Some children are of enormous proportions. The greatest weight observed was nearly twenty-five pounds and the greatest length thirty inches.

But apart from these very exceptional cases, some children are so large that they constitute an impediment to childbirth through a normal pelvis.

Large Head.—It is particularly the head that gives trouble, not only by its size, but also by its lack of compressibility. As a rule, the two go together, the large head being harder than the small. In some heads ossification is too advanced. The sutures are too narrow, the fontanelles too small, and the head so hard that normal moulding is rendered difficult or impossible. Other heads are simply too large, which is apt to lead to pelvic presentation or rarely to cross presentation.

Male children have on an average larger heads than female children. The older the mother is the larger the head of the child becomes. The size of the head, especially the length of the biparietal diameter, increases with the number of pregnancies up to the seventh. Large women are apt to have large and heavy children. The size of the father also influences the size and weight of the child. A large man is likely to engender large children.

Diagnosis.—The diagnosis of a large head may be difficult during pregnancy or in the beginning of labor, especially in stout women. But in most cases we can form a pretty accurate idea of its proportions by seizing it above the brim with thumb and index-finger and placing the other index-finger on it from the vagina.

Sometimes the small size of the large fontanelle or the unusual length of the sagittal suture may be felt by vaginal examination. If the head does not engage or if labor does not progress, although the pelvis is normal, it may be surmised that the head is large. A positive diagnosis can only be made by introducing the whole hand into the uterine cavity and palpating the head.

Prognosis.—As a rule, the case may be brought to a successful end for both mother and child, but some children die.

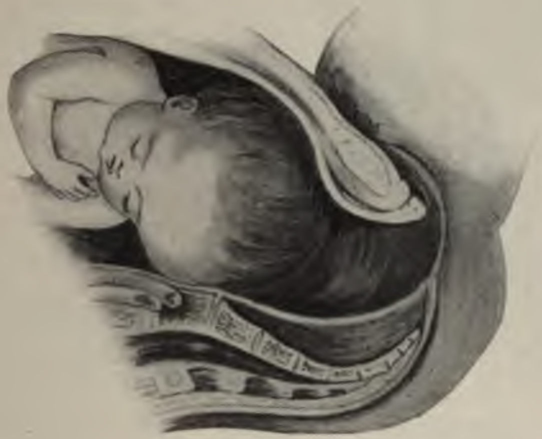
Treatment.—If nature's sole efforts are insufficient to terminate labor, the child should be extracted with forceps. The writer has delivered a child weighing nearly eleven pounds successfully for mother and child by means of symphyseotomy. Cæsarean section has been performed in order to deliver a giant child. This is an operation by which the abdominal wall and the uterus are incised and the child is extracted through the incision. (See OPERATIONS.) If the child is dead, the head should be perforated and extracted with forceps, the cranioclast, or the cephalotribe. (See OPERATIONS.)

Large Body.—It is much more rarely the size of the body that prevents progress of labor. The body being so much more compressible than the head, where the latter has passed, generally the former can follow. If it does not do so, we may help deliver it by rotating the shoulder forward or by pulling the arms down, always taking the posterior first, because there is more room behind in the pelvis, and when the posterior is out, the liberation of the anterior becomes easier. The hips may also need help to rotate and to come down.

Very rarely evisceration (see OPERATIONS) may become necessary.

§ 2. **Hydrocephalus.**—Hydrocephalus is a collection of serum in the ventricles of the brain, by which the head of the fœtus becomes enlarged (Figs. 314, 315). The bones of the skull are thin, sutures and fontanelles very large. The face remains small, and the body is often wasted and shrivelled. In most cases the vertex presents, but pelvic presentation is unusually common with hydrocephalus. On account of the great compressibility of the head, it may, in spite of its size, become engaged and pass through the pelvis as a sausage-shaped mass. Or the head may rupture, giving outlet to the fluid, when the child may be born. Hydrocephalus is, fortunately, a rather rare disease.

FIG. 314.

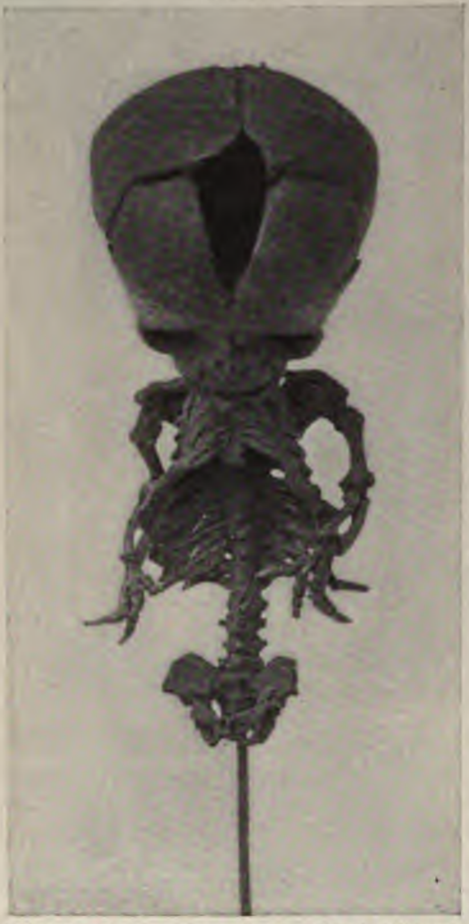


Hydrocephalus.

Diagnosis.—The diagnosis is often difficult, especially in breech presentation. By abdominal palpation we may be able to feel the large head above the brim or at the fundus. If the head presents, we may feel the large sutures and fontanelles and notice the thinness of the bones of the skull. Sometimes Wormian bones are felt in the sutures. If we cannot account for the non-engagement of the head, the whole hand may be passed into the uterus, when we will be able to feel the size of the skull, the large sutures and fontanelles, the thin bones, and the abnormal compressibility of the head. But if the lower uterine segment is much distended, we might rupture it, and it then is safer to abstain from this procedure. In breech presentations we may surmise the condition from the poor development of the body.

Prognosis.—The prognosis, so far as the child is concerned, is decidedly bad. Most of the children die during labor or shortly after their birth. For the mother the prognosis is not so bad, but still serious. Frequently the lower uterine segment ruptures, and prolonged pressure on the cervix and pelvic tissues leads often to infection, which may end fatally. The operative treatment, if properly performed, ought not nowadays to endanger her life or health. The frequency of the pelvic presentation is in her favor, since the small body is easily borne and the head can be diminished before it commences to press on the maternal tissues.

FIG. 315.



Skeleton of hydrocephalic fœtus. (Wood's Museum, Bellevue Hospital, No. 1237.)

Treatment.—If the vertex presents, the fluid may be aspirated and thus the head diminished without necessarily killing the child. It is true these children are of little value, and we should certainly let their life weigh very little compared with that of the mother, but under some circumstances great interest may attach to the birth of a living child, even if it is predestined not to survive. After puncture the case may be left to nature, or we may by pressing from above help to push the head through the pelvis. If necessary, it may be pulled out with forceps, cranioclast, or cephalotribe.

If the lower uterine segment is not too much expanded, we may also, after having diminished the head by aspiration, perform version and extract.

In breech presentation the aspiration is performed behind the ear in the large posterior side fontanelle.

§ 3. **Other Cephalic Enlargements.**—ENCEPHALOCELE, a tumor formed by part of the brain protruding through an opening in the skull and covered with skin, is most frequently found on the occiput or at the orbit, less often in connection with the vertex. It may form a swelling large enough to impede delivery.

EPIGNATHUS.—Rudiments of a second fœtus may form a tumor hanging out of the mouth, which is called an epignathus.

FŒTUS IN FŒTU.—A rudimentary second fœtus may also be embedded in the head and cause its enlargement.

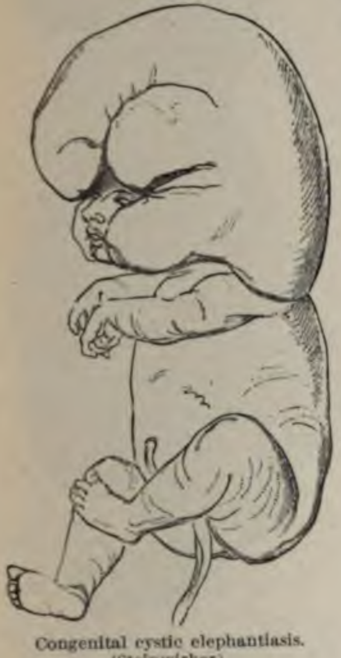
ELEPHANTIASIS CONGENITA CYSTICA has been observed in a unique case. It formed a helmet-like swelling of the head (Fig. 316).

§ 4. **Abdominal Enlargement.**—More frequently than the head, the enlarged abdomen gives rise to dystocia.

ASCITES is not rare. It may be found in a macerated fœtus, or in consequence of liver disease or syphilis.

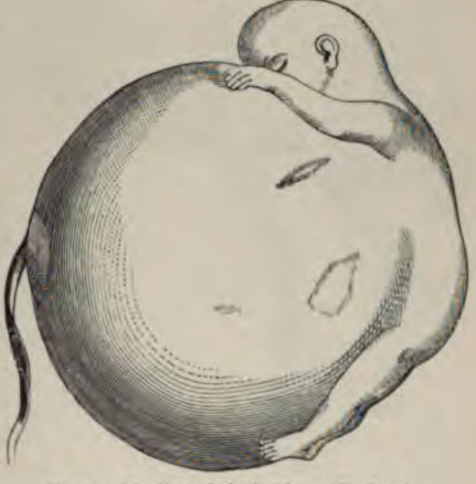
Diagnosis.—Whether the head or the breech precedes, the fetal abdomen is arrested. It may not be distinguished from an overfilled bladder. The fluid should therefore be drawn with an aspirator or small trocar.

FIG. 316.



Congenital cystic elephantiasis. (Steinwirker).

FIG. 317.



Fœtus with distended bladder. (Hecker.)

PERITONITIS may also cause swelling and the accumulation of fluid in the abdominal cavity.

CARCINOMA OF THE LIVER, CYSTIC DEGENERATION OF THE KIDNEYS, FIBROCYSTIC DEGENERATION OF THE UNDESCENDED TESTICLES, HYDRONE-

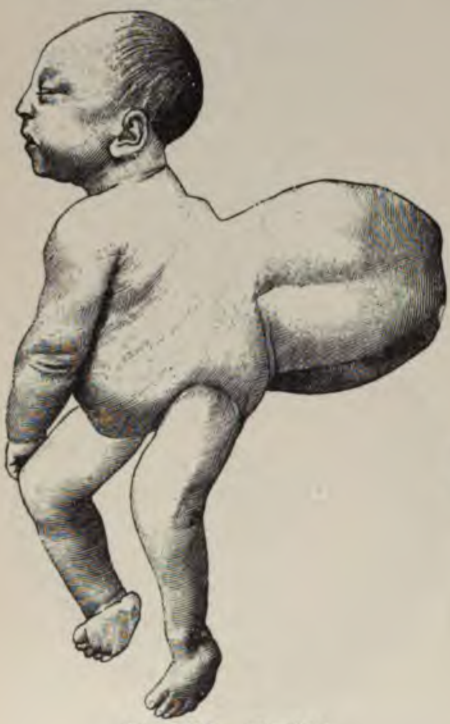
PHROSIS, and DISTENDED BLADDER (Fig. 317) have all formed tumors that have caused difficulties in labor.

§ 5. **Other Swellings.**—HYDROTHORAX is much rarer than ascites, but has also been found forming an obstacle to delivery.

HYDRORRHACHIS, or SPINA BIFIDA, may form so large a swelling that considerable difficulty arises (Fig. 318).

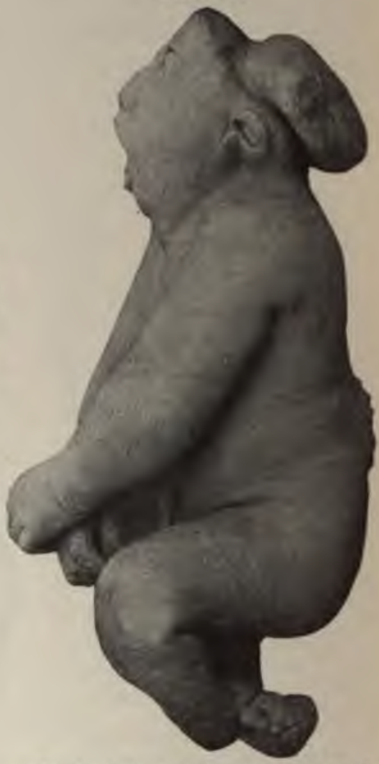
ŒDEMA, EMPHYSEMA, and TYMPANITES may all develop during labor and cause difficulty. Even a large ANEURISM OF THE AORTA and swelling due to LYMPHECTASIA have impeded delivery.

FIG. 318.



Spina bifida. (Zweifel.)

FIG. 319.



Hemicephalus, or anencephalus. (Wood's Museum, Bellevue Hospital, No. 1243.) One-third actual size.

FŒTUS IN FŒTU.—One fœtus developing in the body of the other may form a tumor.

Treatment.—As to treatment much must be left to the judgment of the accoucheur. We can only say in general that he should be as conservative as possible. Often a tumor may be pushed back into the corner of the pelvis, where there is more room. When it is cystic and diminution of its size is necessary, we should use an aspirator or a fine trocar, that will not kill the fœtus or cause much injury. But if the swelling is solid and of large size, recourse must be had to embryotomy.

HEMICEPHALI, OR ANENCEPHALI, are monstrosities in which the brain and skull are nearly absent (Fig. 319). On the other hand, the body is usually stout. These monsters often present by the face. Their broad shoulders may make engagement difficult.

The *diagnosis* can sometimes be made by feeling the absence of the skull through the abdominal wall. By vaginal examination the sharp, bony edge surrounding the top of the head may be felt. Delivery should be accomplished in the way that will interfere least with the mother. Turning will probably be the simplest, and if there is any resistance to extraction, the accoucheur should at once resort to crushing.

CHAPTER V.

TWIN LABOR.

IN cases of multiple fetation labor is apt to come on prematurely, and when once the lower part of the cervix is expanded and the os has begun to dilate, nothing can prevent the continuation of labor.

The abdomen is unusually distended, in consequence of which uterine contractions are weak. The stage of dilatation is therefore slow. During that of expulsion pressure is exercised through the liquor amnii of the second ovum and therefore less effective than when it is applied immediately to the fœtus.

We have seen above that the twins may be found in a single or a double ovum. The fœtuses may be placed differently. In about half the cases both are in vertex presentation (Fig. 320). In one-third the first presents by the vertex and the second by the breech (Fig. 321). A double breech presentation is found only in 9 per cent. Still more rarely the first fœtus is placed longitudinally, vertex or breech pointing downward, and the second transversely, or both may be in transverse presentation, which is the rarest of all combinations.

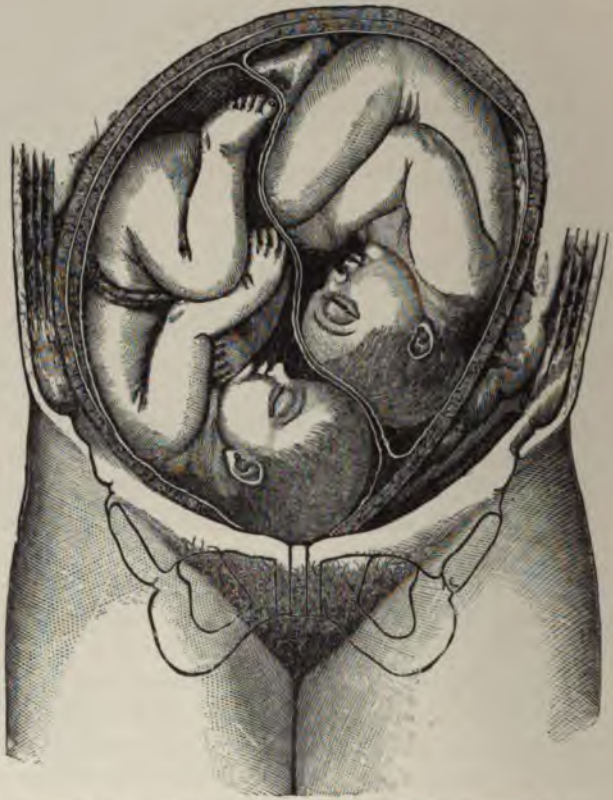
As a rule, one bag of waters forms at a time, but in exceptional cases two bags have been felt at once.

In the vast majority of cases labor takes place in the same way as in those where there is only one child. After the expulsion of the first child, there is a lull in the uterine contractions, a new bag of waters is formed, and the second child is born ten or fifteen minutes after the other, or at least within thirty minutes. In rare cases the interval may extend over hours or even several days. If the first labor was premature or an abortion, months may elapse before the second twin is born.

After the birth of the first child, the second may change its presentation. If it was placed transversely, it may change to longitudinal presentation, but the inverse may also occur, and a previously longitudinal presentation be converted into a transverse.

The placentæ may, as we know, be more or less grown together, but even then the whole surface occupied is larger than in ordinary labors, and this is so much more the case if they are separate. Then there is danger of one coming so low down that during the stage of dilatation it becomes loosened and causes hemorrhage.

FIG. 320.



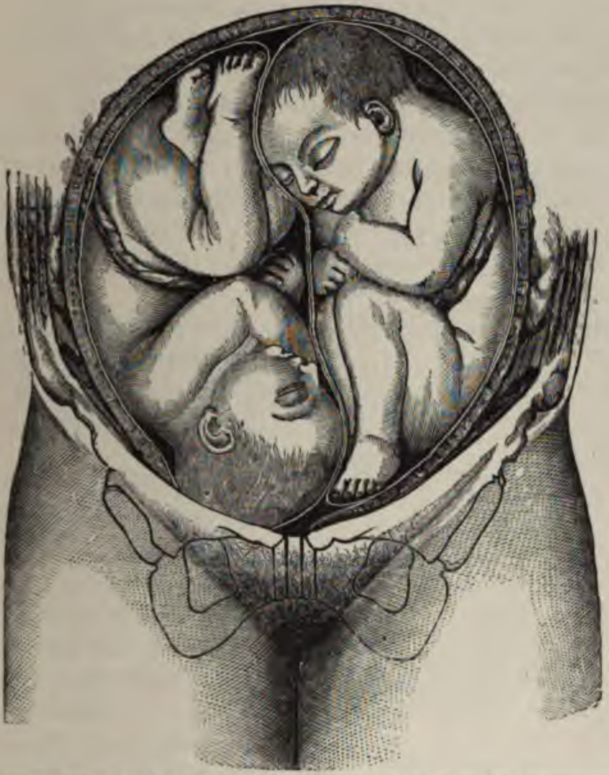
Twins in vertex presentation. (Tarnier and Chantreuil, l. c.)

In general, both placentæ are retained till both children have been born. But when the first child is born, sometimes the second placenta is expelled ahead of the second child, which soon would die from loss of blood, if we did not come to its help by extracting it.

Even after the expulsion of both placentæ there is a tendency to hemorrhage, wherefore twin births demand special watchfulness.

Diagnosis.—While the diagnosis of twin pregnancy before labor begins, as we have seen, is by no means easy, during labor it becomes an easy matter. The small size of the presenting part in comparison with the large abdomen may already awaken the suspicion that we have to deal with twins. It becomes sure when we feel two bags of waters or two umbilical cords, or a soft macerated fœtus or a pulseless cord together with a beating heart.

Fig. 321.



Twins, one in vertex the other in breech presentation. (Tarnier and Chantreuil, l. c.)

When the first child is born, one has only to feel through the abdominal wall in order to ascertain the presence of a second child with a bony skeleton, which gives an entirely different sensation from that imparted by the muscular uterus and soft, pulpy placenta. By vaginal examination we may feel a second bag of waters and the presenting part of the fœtus.

Prognosis.—For the mother the prognosis is upon the whole good.

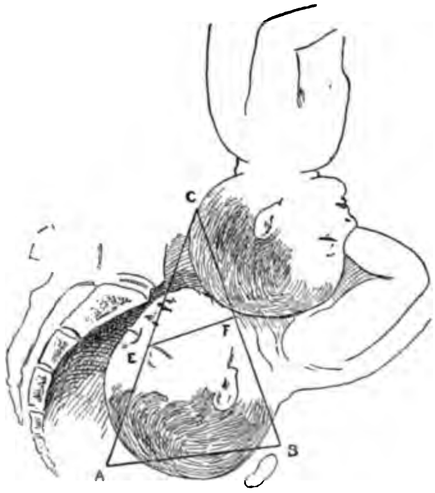
There may, however, sometimes be the drawback of a tedious labor, the necessity of operative interference, and, consequently, greater danger of puerperal infection. There is also some danger of hemorrhage from the placenta, either during or after labor.

For the child the prognosis is much less good. The children are smaller than an average single child. Labor often comes on before they have been carried the normal length of time. In nearly half the cases the second child is in an abnormal presentation. One child may be in the way of the other during labor. Often some kind of conservative operation is needed to end labor, and sometimes destructive operations become necessary. Finally, the mother has rarely milk enough for two children, so that they have to be fed artificially.

Treatment.—When the accoucheur discovers the presence of a second child, he should inform the friends of the condition, but not the mother, as it might cause undesirable excitement.

Under ordinary circumstances the conduct of labor is the same as in single labors. Only greater vigilance is required, especially with regard to hemorrhage or collision between the children, since timely interference may avoid great evil.

FIG. 322.



Locked twins, both in head presentation. (R. Barnes.)

On account of possible connection between the two placentæ, the proximal end of the cord should invariably be tied, as otherwise the second child might bleed to death.

As twins are sometimes so like each other that they cannot be distinguished, it is advisable to tie a ribbon around the wrist of the first-born child.

When the second bag of waters is formed, it is best to rupture it, as the canal has been fully dilated by the passage of the first child. If any danger menaces mother or child, the second child should at once be extracted, with or without turning. Otherwise it is better to wait and give the uterus full time to contract well so as not to risk post-partum hemorrhage. It is well to tie a binder tightly around the abdomen, or still better to hold the uterus with the hand. Even after the birth of the second child and both placentæ, the uterus should be watched on account of the tendency to hemorrhage.

If the first fœtus is in breech presentation, it is quite common that some assistance is required in delivering the head, since the uterine contractions work under a disadvantage.

If help is needed in delivering the second child, as a rule version and extraction are indicated; but if the head is in the pelvic cavity, it should be extracted with forceps.

If both fœtuses present at the same time—so-called *locked twins*—assistance is called for. If both heads present, we try to push one up and pull the other down with forceps. If this does not succeed, the upper head must be perforated.

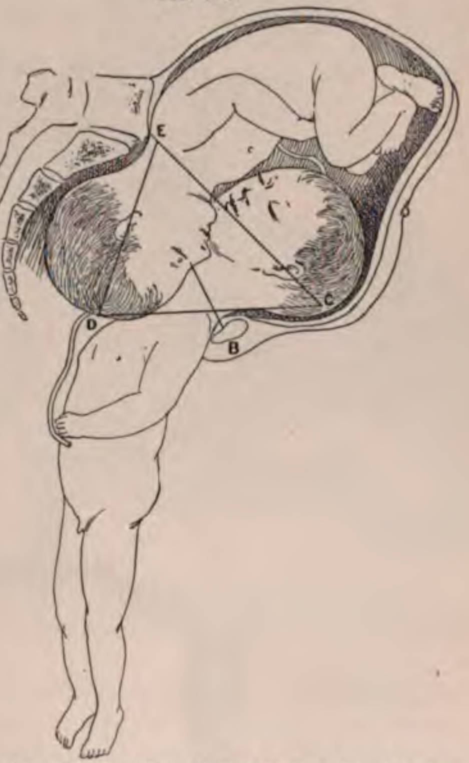
The head of the second fœtus may be lodged between the chin and thorax of the second (Fig. 322). One may, perhaps, disentangle the heads by external and internal manipulations. Failing this, one may seize the foremost head with the forceps, and whilst an assistant pushes away the second head the first child may, perhaps, be extracted.

If head and breech try to enter the pelvis at once, the breech should be pushed up and forceps applied to the head.

If the lower fœtus is in breech presentation and the second presents by the head, we try first to push the head out of the way, and, if that does not succeed, to pull it through by applying forceps.

But the second child's head may again be lodged between the chin and chest of the partly born child (Fig. 323), the two heads forming a wedge, the base of which cannot pass the brim of the pelvis. Then the first child must be sacrificed, which is so much more readily decided upon as in all likelihood it will by this time be dead. The neck should be severed with scissors or a wire écraseur and the head pushed up into the abdomen.

FIG. 323.



Locked twins, first child partly born in breech presentation, the second lodged with the face under the chin of the first. (R. Barnes.)

If both fœtuses present by the breech, the accoucheur shoul up the upper and extract the lower.

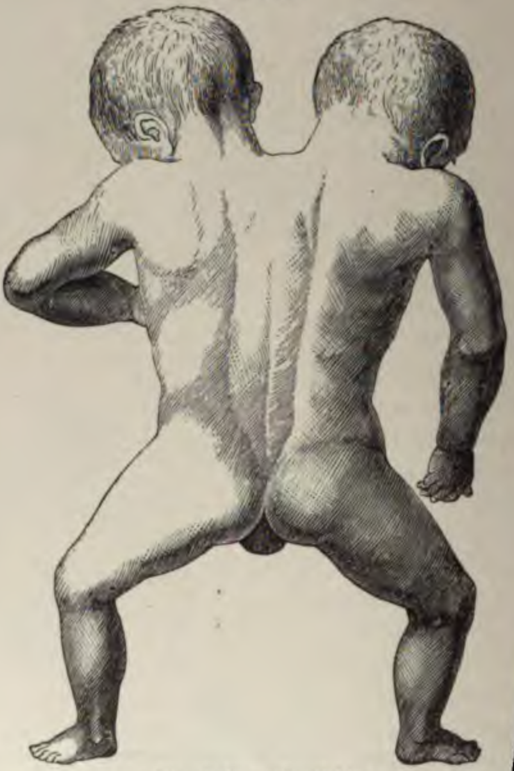
Sometimes all four feet may present. Then we should one child first by its feet, but before so doing we must make ful examination so as to avoid pulling on extremities belon two different children. If a foot or a hand presents with the h should try to push it up.

CHAPTER VI.

DOUBLE MONSTROSITIES.

WHEN one germ by fission gives rise to the formation bodies, these may become entirely separated, and each form a body. Then they are simply twins contained in one ovum

FIG. 324.

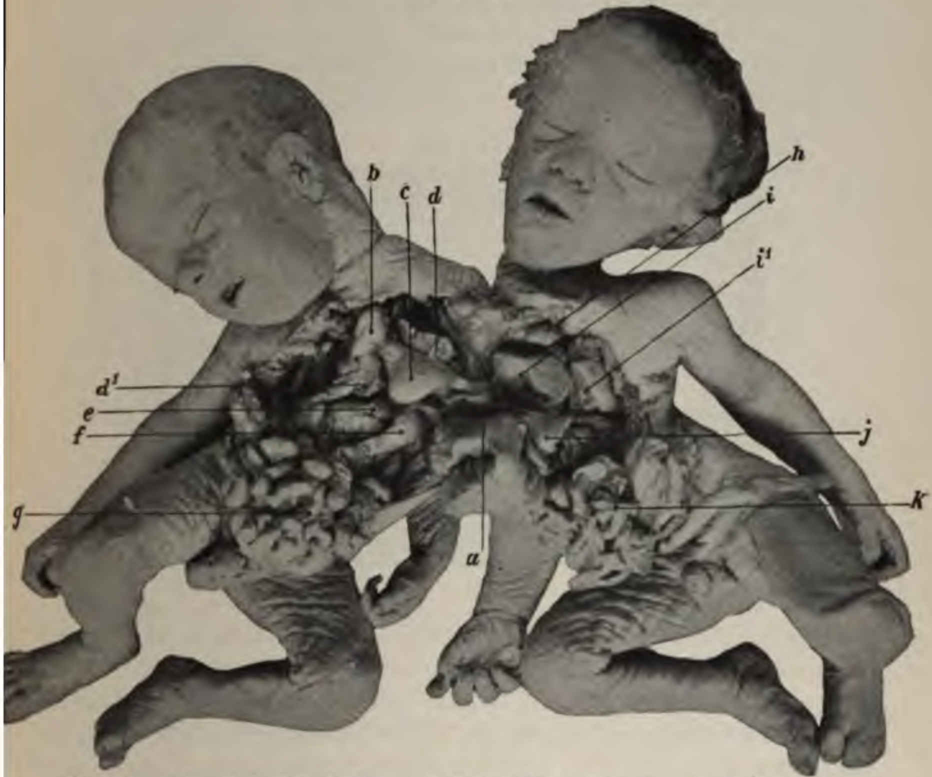


Dicephalus. (Zweifel.)

sometimes the process of fission is imperfect, and the the two bodies remain more or less united, and in m metrical parts of the bodies are missing (Fig. 324).

In the conjoined Chinese twins, Eng and Chang, from their birthplace known as the *Siamese twins*, the separation was perfect, except that a narrow band extended from one sternum to the other. The two men so curiously linked together were both married and lived till the age of sixty-three years. They wanted to be separated, but no surgeon could be found willing to do so. Finally they died, with an hour's interval, in 1874.

FIG. 325.



Thoracopagi dissected. (Wood's Museum, Bellevue Hospital, No. 1257.) Length of bodies sixteen inches (forty-one centimetres). *a*, single liver; *b*, right thymus; *c*, right heart; *d d'*, right lungs; *e*, right pancreas; *f*, right stomach; *g*, right intestine; *h*, left heart; *i i'*, left lungs; *j*, left stomach; *k*, left intestine.

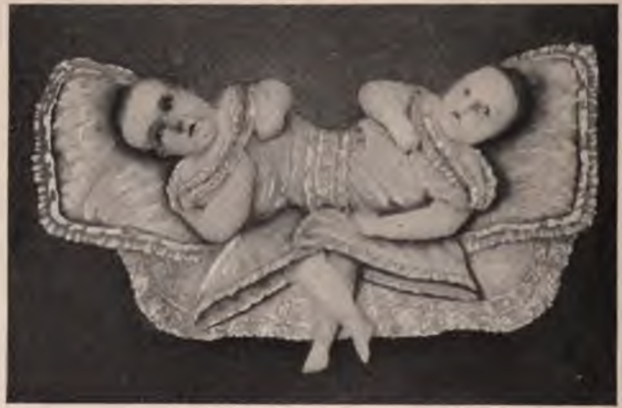
In 1900 the Brazilian conjoined twins, Rosalina and Maria, also thoracopagæ, were separated by Dr. Chapot-Prevost, of Rio Janeiro, one dying from pleurisy, the other surviving; and in 1902 the Hindoo thoracopagæ, Radica and Dordica, were separated by Dr. Doyen, of Paris. Both were tuberculous, and one died a few days after the operation.

In the pair represented in Fig. 325 only the liver was common for the two bodies: all other organs were double.

Double monstrosities are not very rare: specimens of them are found in most obstetrical museums; but they are rarely born alive and still more rarely do they survive. The Hungarian sisters, Helen and Judith, were united by the back, and lived twenty-three years. I have seen a similar formation in two grown-up conjoined negro girls, called *Millie and Christine*, and a double white baby called *Rose-Marie*, who had one body from the pelvis down, while above the pelvis the bodies separated nearly at right angles (Fig. 326).

Some women have repeatedly borne double monstrosities, and sometimes hereditary influence seems to play a *rôle.* Such monstrosities may be born without any skilled assistance, and were so in twenty out of thirty-one cases collected by Playfair. Most of them present by the pelvic end, which greatly facilitates their birth. But in some cases delivery is exceedingly difficult. Still, upon the whole, the prognosis is good for the mother.

Fig. 326.



Rose-Marie, dicephalus.

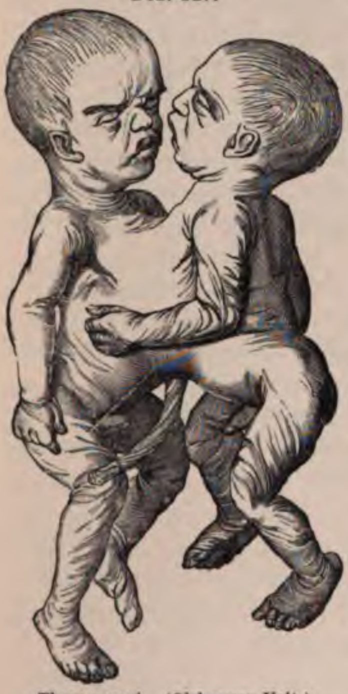
From an obstetric stand-point we may distinguish four classes of such cases.

A. The two bodies may be united in front,—*thoracopagi* (Fig. 327),—to which class the Siamese twins belonged, and which is the most common. Nature usually ends these cases by expelling all the feet first, and that is therefore the way to be imitated. If possible, all four legs should be brought down and the posterior head delivered first by pulling the body of the child strongly up over the abdomen of the mother. Last comes the second head. The backs should be kept in an oblique diameter, as this is longer than the anteroposterior and offers the advantage that the bodies are not so likely to be arrested by the promontory and symphysis. In a case of this kind delivery was accomplished by cutting off one-half of the anterior body.

If the heads present first one head is born; then comes the body by a process of spontaneous evolution; and last the second child is born, probably footling, which is possible on account of the great mobility there always is between the two bodies in this class—a mobility which allows the accoucheur to turn the bodies so that the head end of one lies in contact with the foot end of the other.

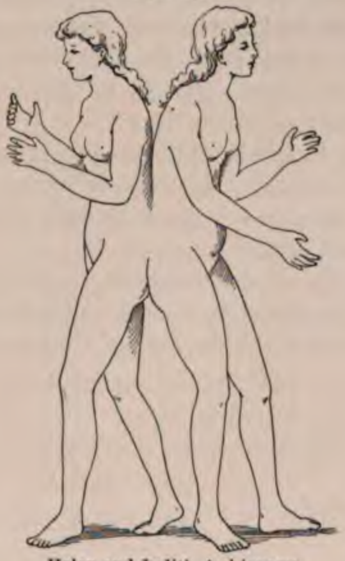
A rarer mechanism of labor with head presentation is that one head follows the other, being pressed against its neck. This has also successfully been imitated, each head being pulled out with forceps and the bodies then pulled out simultaneously. But it is evident that this mode is only possible if the fœtuses are unusually small or the pelvis exceptionally large.

Fig. 327.



Thoracopagi. (Olshausen-Veit)

Fig. 328.



Helen and Judith, ischiopagæ.

Sometimes room may be gained by decapitating the first head, and then turn and extract.

The *diagnosis* is very difficult. External manipulation and common vaginal examination give no information. As a rule, the case is taken for one of common twins until labor is arrested. The true nature of the case can be found only by anæsthetizing the patient and introducing the hand far enough to feel the place of union between the two fœtuses.

B. The second class comprises those double monstrosities which are united by the back, especially the pelvis,—*ischiopagi*,—to which Helen and Judith belonged (Fig. 328). Delivery is probably still more difficult than in the former class, the area of junction being less yielding. The treatment is the same, namely, to bring down all four legs or to extract one head after the other.

C. The third class is composed of double monstrosities which have two heads and more or less of the upper part of the body double and only one lower part of body,—*dicephali* (Fig. 324). In the natural mode of delivery first one head is born, then follows the body by spontaneous evolution, and last comes the second head. If this does not take place, the first head should be decapitated, and the feet brought down, when the delivery of the second head becomes easy.

If exceptionally the feet come down first, the case is treated as in the first class,—that is to say, by pulling the body well up over the abdomen of the mother.

D. In the fourth class the heads are united, the bodies separated, —*craniopagi*. Here the difficulty is caused by the size of the head, and assistance is given by perforating and crushing it, whether it presents or comes last.

With all monstrosities we should not hesitate to mutilate, if anything is gained by it, and under no circumstance should the mother be exposed to the dangers of Cæsarean section.

CHAPTER VII.

ABNORMALITIES OF THE OVUM.

§ 1. **Abnormal Membranes.**—Too Thin Membranes.—If the membranes of the ovum are too thin and friable, the bag of waters ruptures prematurely, whereby the mother suffers more pain than when the cervix and os are being gradually expanded by the elastic membranes. There is also greater danger of infection taking place, especially if many vaginal examinations are made. The child is exposed to a pressure that may interfere with circulation and respiration or give rise to prolapse of the cord, and if all the water drains off,—a so-called *dry birth*,—the necessary movements of the child during expulsion may be impeded.

But the beginner should not form an exaggerated opinion of the importance of the premature rupture of the membranes. Most of the time it has no appreciable effect, the cervix closing in on the presenting head. Sufficient liquor amnii is retained. The patient should, however, be kept in bed and defecation made easy by the administration of a mild aperient, like Hunyádi Janos water.

MEMBRANES TOO RESISTANT.—If, on the other hand, the membranes are too tough and resistant, they do not rupture when the cervix is dilated. Thus the force developed by the contracting uterus is partly lost, and the whole ovum, as we have seen, may be expelled unruptured.

When the os is fully dilated, the accoucheur should rupture the membranes. This may be done by seizing them in the interval between two contractions and tearing them, or more easily during a labor-pain by pricking them with the stylet of a catheter or a sharpened goose-quill. In performing this little operation the accoucheur should, however, be careful not to enter more deeply than necessary, as otherwise he might injure the fœtus. For cleanliness it is well to place a bedpan under the patient, into which the expelled liquor amnii will flow.

If the child is born in the ovum, this should be torn in order to admit air to the lungs.

ADHERENT MEMBRANES.—In normal labor separation between the uterus and the ovum takes place in the ampullar layer of the decidua. But if there has been endometritis before or during pregnancy, the decidua is too thick and resistant, and the chorion adheres more or less to it. Then the separation takes place between the chorion and the amnion, and the chorion and decidua are retained, which may give rise to hemorrhage. If this occurs the accoucheur should introduce his whole hand into the uterus and scrape off the retained membranes with his finger-nails, and then give an intra-uterine douche, preferably with creolin on account of its combined antiseptic and hæmostatic properties.

If there is no hemorrhage, but a large piece of the membranes is retained, then it is well to tie a silk thread to it, and leave it until the following day, when by pulling on the string the shred is easily removed. The smaller shreds are discharged with the lochia.

§ 2. **Abnormalities of the Umbilical Cord.**—COILING.—We have seen that during pregnancy the cord may be wound around the body of the fœtus. It may also lie coiled up in front of the presenting part, and during labor the child may be pushed through one or more circumvolutions. In this way a cord that really is too long may become relatively too short and prevent the proper movements of the fœtus during labor. It is quite frequently twisted once or twice around the neck, which exposes the child to strangulation. When this is the case, the accoucheur tries to loosen the string and to pull it over the head or let the child glide out through the loop. In breech presentation it may descend between the legs and extend over the back. Then the loosened loop should be pushed over one of the buttocks. But if the cord does not yield so as to allow these displacements, it should be cut and both ends tied.

SHORTNESS OF CORD.—If the cord is so short that it interferes with the free movement necessary in labor, it may be torn off near the body of the fœtus, which may bleed to death while still in the uterus. Or if the cord holds it may pull off the placenta from the uterus and cause hemorrhage and asphyxiation in that way. Or if also the placenta resists, the uterus may become inverted or the birth of the child may be prevented.

The *diagnosis* during pregnancy is impossible and during labor difficult. We may be brought to think of this condition if the meconium is expelled or the heart-beat becomes slow. If the cord can be reached, it may be felt tense, and should then be cut at once, and the fœtus extracted.

PROLAPSE OF THE CORD.—The umbilical cord may present at the brim below or with the other presenting part before the membranes rupture, and it may, after the waters have broken, sink down into the vagina or even outside of the vulva, while in other cases only a small loop is found outside the os.

The frequency with which this unfortunate accident occurs, seems, like that of face presentations, to vary much in different countries. In France it was only observed in 1 case of each 446, in England in 1 out of 207, and in Germany in 1 out of 156. Maybe the usual posture used in delivering women has some influence: in France they place the woman on her back with somewhat elevated pelvis, in England they use the lateral posture, and in Germany they prefer the dorsal position with elevated shoulders, which would certainly promote prolapse of the cord. But perhaps the relative frequency of contracted pelves accounts for a corresponding frequency of prolapse cases.

Etiology.—The chief factor that causes presentation and prolapse of the cord is a deficient adaptation between the presenting part and the brim of the pelvis. They occur, therefore, in contracted, especially flat, pelves. They are much more frequent with abnormal presentations, especially transverse, face, and foot presentations, than with vertex presentation. Flaccidity of the lower uterine segment will give rise to a less perfect adaptation between the uterus and the presenting part, and we find also that the accident is much more common in pluriparæ than in primiparæ. The longer the cord is, the greater is *cœteris paribus* the chance of its prolapsing. A large amount of liquor amnii and its sudden discharge will be apt to wash the cord down. A premature rupture of the membranes and a prolonged partial opening of the os naturally increase the danger of a prolapse occurring. A low insertion of the placenta will also favor it. With a vertex presentation it can only happen at the time of rupture or shortly after. When first the head is well engaged, there is no space left for the prolapse to take place in.

Diagnosis.—Before the waters break it is not always easy to recognize a presenting cord. Still, in an interval between pains, when the bag relaxes, we may feel the movable, soft, finger-thick string and its pulsation. When the membranes have ruptured, a small loop high up in the vagina may be overlooked, but if the fetal heart-sounds grow weak and slow, the accoucheur should bear in mind the possibility of its presence and feel for it. When a larger loop descends into the vagina, it obtrudes itself on the examining finger and cannot be taken for anything else.

Prognosis.—The prognosis for the mother is good, but that for the child is so much the worse. For it prolapse of the cord is one of the most dangerous complications of childbirth. According to statistics over one-half of the children die. The mortality is greater in primiparæ than in pluriparæ, which can easily be accounted for by the more tedious labor and the greater firmness of the soft parts of the parturient canal. If prolapse of the cord is comparatively rare with vertex presentation, on the other hand it is much more dangerous than with other presentations, the cord being more apt to be squeezed between the hard skull and the pelvis. The breech is softer, and with a transverse presentation or a foot presentation there is hardly any danger. With vertex presentation the infantile mortality reaches the terrible number of 64 per cent.

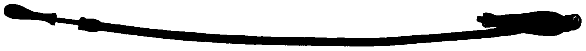
The great danger in prolapse of the cord arises mainly from compression, which, as we have seen in speaking of delivery in pelvic presentations, leads, in a very short time, to asphyxia and death of the child.

Treatment.—The diagnosis once made, the patient cannot be left a moment alone. She and her child have to be watched constantly, since, when the time for action has come, delay means the death of the latter. We must distinguish three different conditions, each calling for different assistance,—the time before the rupture of the membranes, the time after rupture of the membranes with a not fully dilated os, and the time after full dilatation has been accomplished.

As long as the membranes are unruptured, there is little or no danger, and, on the other hand, it is of the greatest importance to preserve them till full dilatation is established. To try to push the cord aside is of little avail, since in all likelihood it will fall down again, and we run the risk of rupturing the membranes by our manipulations, which would make the situation worse. We may place the patient in the elevated-pelvis position on her back, and whether the cord slides away or not, we may then place the patient on the side where the prolapse was, the effect of which is to tip the fundus down on this side and the lower uterine segment over to the other side, so that there is less pressure on this side in case the cord falls down again. The position on the back with the head low cannot be sustained very long, unless the patient is anæsthetized, which is not desirable, since we want labor-pains to dilate the os. If the cord slides up into the cavity of the uterus, we may by pressure from above try to press the head into the brim and thus prevent the prolapse from being reproduced. In order to further dilatation a colpeurynter may be placed in the vagina which protects the membranes, but if stethoscopy shows that the cord is being compressed, the colpeurynter should be removed.

If the os is not sufficiently dilated to end labor with forceps or version, but the waters have broken, the patient should be placed in the elevated-pelvis position and the cord replaced with a suitable instrument, such as represented in Fig. 329.

FIG. 329.



Repositor for prolapsed umbilical cord.

I found it in an instrument-maker's store, but could not ascertain the inventor's name. All the people remembered was that it had originated with a California doctor.

The instrument consists of a rather stiff flexible tube through which runs a whalebone stylet with handle. At the other end is a bit of ribbon with a button that fits into the end of the tube. The ribbon is carried around the prolapsed cord, the button pushed into the tube, and this together with the cord brought all the way up to the fundus, where it may be kept till after the birth of the child, but if it is sure that the cord cannot again prolapse, it may also be withdrawn after releasing the ribbon by pushing the button out by means of the whalebone staff.

The position with elevated pelvis facilitates the replacement very much.

Where no operating-table with facilities for elevating the pelvis is available, we may improvise one by using a chair as we did to raise the shoulders (Fig. 222, p. 191), but now the chair is placed under the pelvis and the feet are bent over the round (Fig. 330).

Or else the patient may be placed on a padded ironing-board, the lower end of which is raised and fastened to the foot of the bed or a chair.[1] The elevated-pelvis position has the advantage over the knee-chest position, which generally is recommended, that the patient can

---

[1] The elevated-pelvis position is mostly known in this country as Trendelenburg's position, from the name of the surgeon who has contributed most to popularize it, but it was used and described years before by Bardenheuer, of Cologne, in his work, "Drainage der Peritoneal Höhle," Stuttgart, 1881. In Germany it is called Beckenhochlage.

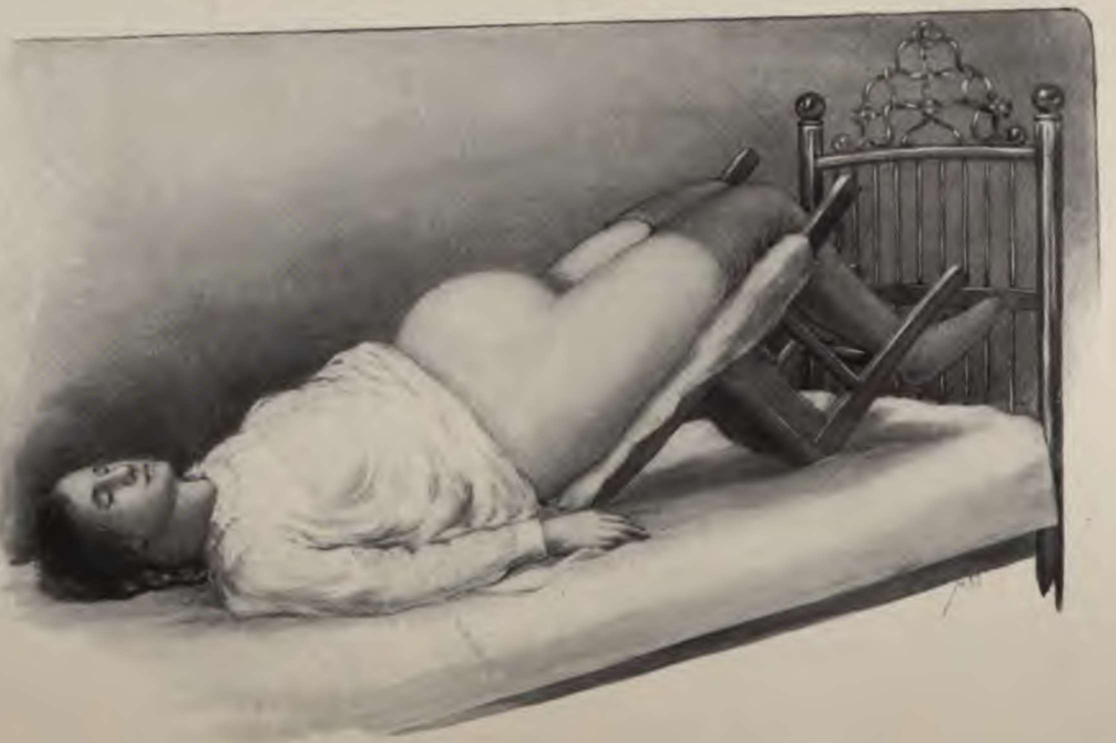


FIG. 330.—Elevated-pelvis position on an inverted chair

be kept longer in it without being anæsthetized, that an anæsthetic can easily be administered, and that it is more favorable for performing version and extraction. By pulling the patient so far out as to have the lower extremities fall down at full length we obtain even Walcher's Hängelage, which facilitates extraction, as will be described later. (See OPERATIONS, Fig. 424.)

Having replaced the cord, the accoucheur should anæsthetize the patient, and try if he can dilate the cervix manually according to the method of Dr. Philander A. Harris. (See OPERATIONS, Fig. 422.)

The third eventuality, and that most frequently met with in consultation practice, is that the os is fully dilated when the patient is seen. Then the patient should rapidly be put in the elevated-pelvis position, and the accoucheur seize the prolapsed cord with his whole hand and, if possible, carry it up into the abdomen, turn and extract. If there is any compression of the cord, this should be done without anæsthesia in order to save time. If there is no room to pass the hand, he should apply the forceps and extract as rapidly as possible.

In pelvic presentations one foot should be brought down, as thereby the breech is diminished, and the leg serves as protection for the cord against pressure.

In prolapse with face presentation, and when an arm is prolapsed together with the cord, version and extraction are indicated. In foot presentation it would be useless to try reposition, since the prolapse is immediately reproduced, and there is not much danger of compression.

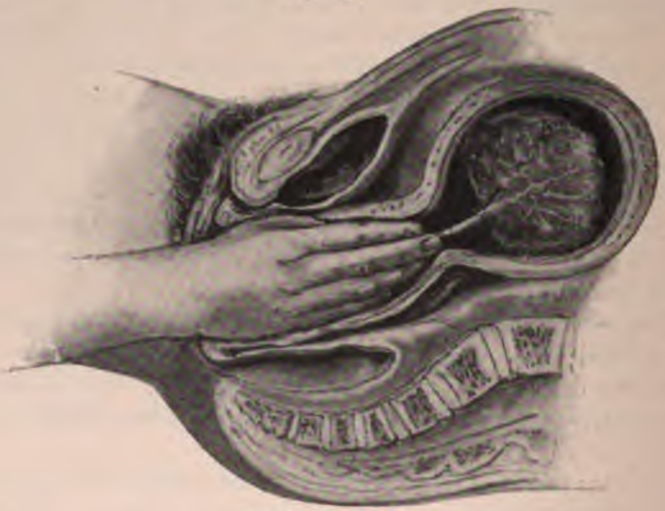
With cross presentation reposition would also be useless, and with this presentation there is no danger of compression. The case is treated with podalic version and extraction as soon as the os is sufficiently dilated. If there is no pulsation in the prolapsed cord, there is no call for any special treatment, and the case should be managed as we would deal with it were there no prolapse; only the accoucheur should, in order to avert blame, foretell to the friends that the child is lifeless.

§ 3. **Retained and Adherent Placenta.**—Normally the placenta can be expressed within twenty minutes, but sometimes our efforts at expression remain fruitless. The after-birth does not come out. This may be due to one of two conditions vastly different in importance. The placenta may simply be retained or it may be adherent.

The *retained* placenta may lie in the vagina or in the uterus. If it is in the vagina, the uterus is well contracted and small, and by inserting two fingers into the vagina we not only feel the placenta, but can easily pull it out by following the cord and pressing on the placenta at both sides of the cord or by hooking the two fingers over the top of the placenta.

The placenta may have been cast loose, but is retained in the uterine cavity by muscular contraction, especially at the seat of the contraction ring. Authors attribute this frequently to so-called *hour-glass contraction*, but in reality the upper part of the uterus is, as a rule, more or less contracted, and the lower part is decidedly flaccid (Fig. 331). Only the contraction is irregular and strongest at the narrowest part of the uterus. Retention of the placenta used to be much more common when the mode of delivery was to pull on the cord or press directly on the placenta inside the uterus. With the introduction of Credé's expression method retention has become a rare accident. This indicates the prophylactic treatment. The curative treatment, if there is a serious obstruction, consists in administering chloroform and pressing on the contracted ring with the fingers united into a cone around the thumb. But often all that is needed is to follow the cord up to its insertion, wind it around the fingers of the left hand, and press on the placenta with the index and middle finger of the right hand, when the placenta readily yields.

FIG. 331.



Retained placenta.

As it is always preferable not to enter the uterus, and the placenta may come out spontaneously or by expression, the accoucheur should be in no hurry about removing the placenta if there is no hemorrhage. It is the writer's rule to wait an hour before having recourse to any other measures than repeated compression of the fundus.

If the uterus has been entered, it ought also to be washed out with some antiseptic solution, especially lysol or creolin.

Adhesion of the placenta is a much more serious matter than mere retention. It may be total or partial; in the latter case it is mostly found at the periphery, while in the centre the connection with the uterus may be normal. The decidua serotina in the adherent parts has been replaced by tough connective tissue, which extends deep into the muscular coat. This condition is usually due to chronic endometritis. Some women have an adherent placenta in several successive pregnancies. It follows sometimes partial detachment of the placenta during pregnancy. The cause may also be an abnormal structure of the placenta, especially a membranous placenta. The adhesion is most frequently found in the cornua of the uterus, the original site of implantation of the ovum, where the connection may have become more solid, or where villi of the chorion may have grown into the tubes. It is also apt to be found with placenta prævia, where the insertion takes place over the os internum.

Prognosis.—Both retention and especially adhesion of the placenta often give rise to hemorrhage, which may prove disastrous to both mother and child.

Treatment.—The patient is placed on a table and anæsthetized, the legs drawn up and the knees bent. The particularly well-disinfected hand is carried between the membranes and the uterine wall up to the upper margin of the placenta; the fingers are bent and the nails are used as knives to sever the connection between the placenta and the uterus, while this is steadied from without with the other hand. If we cannot obtain a line of cleavage here, we try the sides of the placenta and enter where best we can. It is a great advantage if the placenta can be peeled off in one piece and from above downward. But where the connection with the uterus is very dense this is impossible, and we must be satisfied by removing it piecemeal, which is apt to be accompanied by much more hemorrhage.

Besides the fingers, the large dull wire curette (Fig. 411) and a placenta-forceps with good grip and broad dull ends (Figs. 412, 413) may be needed. If necessary, it is better to leave a little of the placental tissue than to perforate the uterus. When as much as possible has been removed, the uterus is irrigated.

§ 4. **Placenta Prævia.**—The fertilized ovum may become embedded so low down on the wall of the cavity of the uterus that the placenta covers the internal os, or at least that portion of the uterus which must change its position in order to allow the dilatation of the os necessary for the passage of the fœtus. When this dilatation takes place, more or less of the placenta is separated from its connection with the uterus, which process is accompanied by hemorrhage, and will be described together with hemorrhage from other sources.

CHAPTER VIII.

OBSTRUCTIONS IN THE PARTURIENT CANAL.

§ 1. **Displacements of the Uterus.**—PENDULOUS ABDOMEN.—We have seen that, as a rule, anteversion during pregnancy is of little importance when there is an abdominal wall offering normal resistance, which makes the uterus rise to the proper position. But if the abdominal wall is weak, the heavy pregnant uterus falls forward, and it may even tip so much downward that the fundus is in the neighborhood of the knees.

Sometimes there is only an unusual flaccidity of the abdominal wall, but in other cases there is such a diastasis between the recti muscles that the uterus protrudes between them and lies directly under the skin.

Through the altered inclination of the uterus to the pelvis, the os is carried too far up and the presenting part is prevented from engaging.

This condition is due to distention of the abdomen by previous pregnancies or tumors, to laparotomies, or umbilical or ventral hernia. It is also found in primiparæ in consequence of a narrow pelvis which prevents the normal descent of the presenting part into the pelvic cavity during the latter part of pregnancy.

The treatment is similar to that mentioned in speaking of deficient abdominal pressure during labor. The fundus of the uterus is to be raised and kept in place with a tightly adjusted binder.

VENTRAL FIXATION AND VAGINAL FIXATION OF THE UTERUS.—A peculiar artificial antedisplacement of the pregnant uterus has been brought about by the different operations by which the anterior surface and the fundus of the uterus are fastened to the abdominal wall or the vagina.[1] The anterior wall being fastened, the uterus must chiefly grow by expansion of the posterior wall, and the os is carried high up. This unnatural position of the uterus gives rise during the progress of pregnancy to much discomfort, such as a dragging pain at the seat where the uterus has been moored, and excessive nausea and vomiting, and it leads often to abortion. During labor it has prevented engagement, causing inertia and rupture of the uterus, and made delivery impossible by the natural way, so that in several cases Cæsarean section became necessary to bring labor to an end.

Any kind of fixation of the uterus itself should, therefore, be deprecated, and such operations be substituted which shorten or attach the round ligaments, and among these again the preference should be given to those in which the uterus is not unnaturally anteverted or anteflexed.

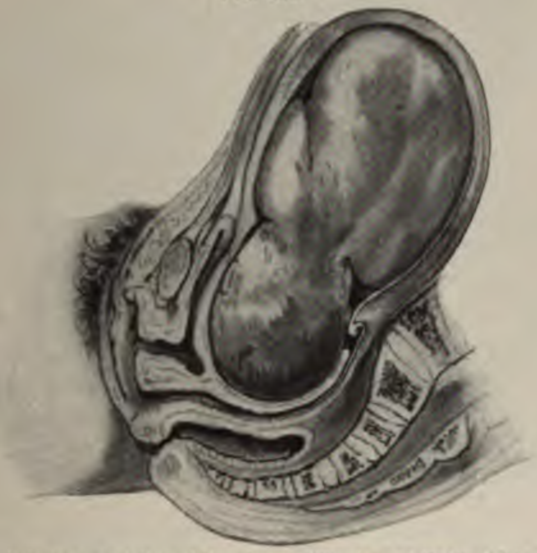
---

[1] Garrigues, Diseases of Women, third ed., p. 473.

LATEROVERSION.—The uterus, in most cases, is tilted more or less to the right side of the abdomen, more rarely to the left. This rarely interferes with labor. If it does, the malposition is easily corrected by placing the patient on the opposite side, when the fundus will sink down towards the couch, and the os move in the opposite direction.

SACCULATION.—If the presenting part, generally the head, presses somewhat unevenly on the lower uterine segment, this will be distended and form a deep pouch, fitting like a hood over the fœtus, while the os remains high up in the vault of the vagina. Most frequently it is the anterior part of the lower uterine segment that undergoes this distention, and the os is, therefore, drawn high up behind the presenting part (Fig. 332) in the neighborhood of the promontory.

FIG. 332.



Anterior sacculation of the uterus. (Tarnier and Budin, l. c.)

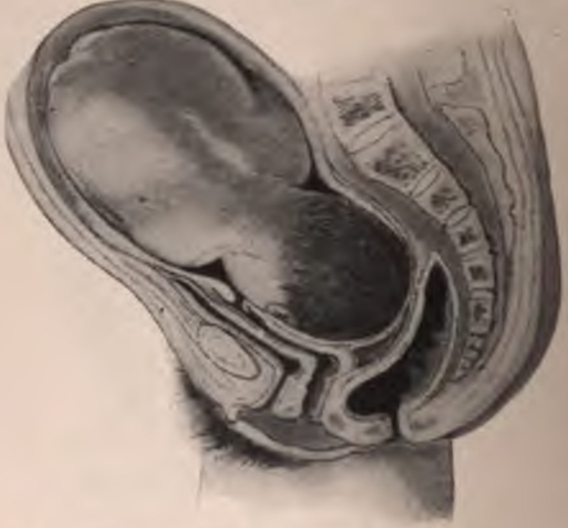
Much more rarely it is the posterior part of the lower uterine segment that forms the sac, while the os is found above the symphysis pubis (Fig. 333). A similar condition has been found with a bicornute uterus, one horn developing in the pelvic cavity and the other in the abdomen.

We have seen that retroflexion, as a rule, corrects itself or is artificially corrected. It happens, however, in rare cases that the replacement is not total, and that a part of the posterior wall of the uterus is retained, while the larger part of it and the whole anterior wall are distended by the growing fœtus. In this kind of cases the labor-pains have not much effect on the os, most of the impetus being spent in distending that part of the lower uterine segment which forms the pouch.

The prognosis is better in anterior sacculation than in posterior. As a rule, the os will open and come lower down. But if the abnormal distention continues, the uterus will rupture.

The diagnosis may be quite difficult. Sacculation has been taken for closure of the os, and an incision has been made in the uterus. It has also been mistaken for a fully dilated os, the distended lower uterine segment being so thin that it was overlooked and the forceps applied outside of it. The pelvic cavity is full, although there is no dilatation. The os is placed at the bottom of a deep pouch formed by the vagina. If it is not within reach of a finger, the whole hand must be introduced during anæsthesia. If the os is in front, something may be gained by placing the patient in the knee-chest position and having her supported by assistants (Fig. 260). In this position the patient rests on her knees, the upper part of the chest, the right side of the face, and the right forearm. The thighs are kept perpendicular, and the back is hollowed. It makes the fundus of the gravid uterus gravitate strongly forward and downward, and consequently brings the os downward and backward.

FIG. 333.



Posterior sacculation of the uterus. (Tarnier and Budin, l. c.)

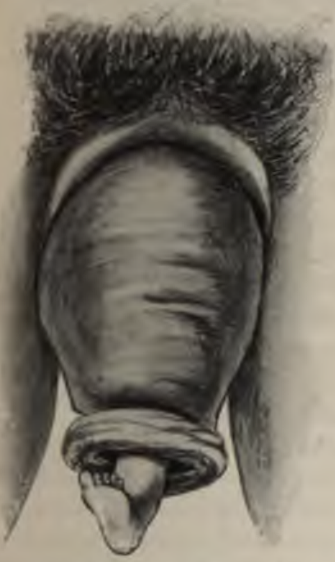
By hooking one or two fingers over the lower border of the os, it is gently pulled down during a uterine contraction, which may be repeated several times, until the os is brought to its normal position. It has been found necessary to make numerous small incisions in the circumference of the os. In another case the fœtus was turned and extracted by the feet, and in one even Cæsarean section was resorted to.

Partial Prolapse.—The whole uterus is never found prolapsed at full term. There may be a prolapse of the lower part of the uterus and the cervix become hypertrophied and œdematous, but the bulk of the uterus is in or above the pelvis. Fig. 334 shows such a prolapse with a protruding foot.

In Fig. 335 is represented a case of head presentation with prolapse and hypertrophy of the cervix.

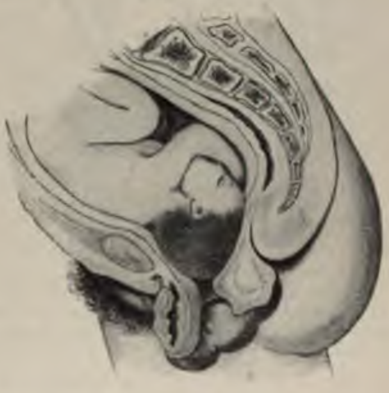
In delivering these cases the uterus should be kept back, while the extraction of the child is made with forceps or hand. That is most readily accomplished by covering the prolapsed part with a piece of muslin with a hole corresponding in size to the os.

Fig. 334.



Partial prolapse of uterus with protruding foot. (Wagner.)

Fig. 335

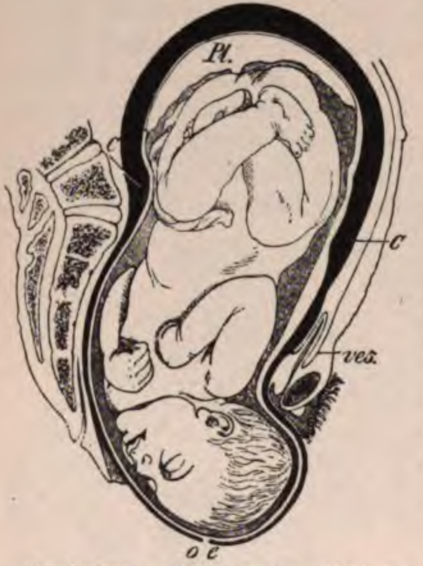


Prolapse and hypertrophy of the cervix with head presentation. (Faivre.)

Uterine Hernia.—The whole pregnant uterus at term has been found in inguinal and more rarely in femoral hernia. A unicorn or bicornute uterus is predisposed to this displacement. The best treatment is to cut down on the uterus, open it as in Cæsarean section, and then amputate it.

§ 2. **Abnormalities of the Cervix.**—Conglutination of the External Os.—It has been contended that after conception the os may become closed by agglutination of its circumference. Perhaps this is a mistake. By careful searching a small opening is found in which hangs a drop of mucus, which is surrounded by a narrow red ring of the cervical membrane and which admits a uterine sound. If this holds good in all cases, there would then not be an agglutination, but a resistance to opening of the os, a rigidity. The fœtus is pushed into the cervical canal, which becomes enormously distended and as thin as a sheet of paper. The head may even be expelled from the genitals covered by the cervix (Fig. 336).

Fig. 336.



Conglutination of the external os. (Jentzen.) Head covered by cervix expelled from genitals. *Pl*, placenta; *C C*, contraction ring; *ves.*, bladder; *oe*, external os.

If there is a real agglutination, it must be due to a mild degree of inflammation. If there is none, the resistance has been attributed to a congenital elongated cervix or to density of the cervical tissue due to chronic inflammation.

It may be impossible to feel the os. The patient should then be put in Sims's position and the vagina exposed with Sims's speculum and Garrigues's retractor. When the os is found, it suffices often to press on it with a finger, metal catheter, or uterine sound to make it open rapidly, which would favor the theory of a real agglutination having taken place. In other cases the cervix retracts slowly, and has to be pushed open with repeated introduction of the sound and pressure on the ring or by pulling it apart with the fingers as in Harris's method of dilatation. (See Operations, Fig. 422.) If the os is really closed and does not yield to pressure, it must be opened by making a small crucial incision over it, or if it cannot be found, over the most declive place. Before deciding on these somewhat risky procedures, the accoucheur should satisfy himself that it is not a case of sacculation with the os placed high up in front or behind.

Closure of the Cervical Canal.—The cervical canal may become closed after conception has taken place, either partially, especially at the os, or in its whole length by formation of cicatricial tissue. This may be due to catarrh or ulceration of the cervix, but is more frequently due to the treatment of these conditions with caustics or to operations such as trachelorrhaphy, amputation of cervix, etc.

During labor the fœtus can descend only as far as the obstruction. If uterine contractions do not suffice to overcome it, the accoucheur must remove it, if possible, by means of a sound, but if he does not succeed with a blunt instrument, he must have recourse to sharp ones. The cervix must be perforated with a curved trocar, and perhaps, besides that, incised in four directions. It is safer to make multiple shallow incisions than one or two deep ones.

Stenosis of Cervix.—The cervical canal may be narrow, either from congenital malformation or inflammation and the formation of cicatrices. In these cases the efforts of nature may be assisted by the use of Barnes's and Champetier de Ribes's dilators.

Old Cervical Lacerations.—Cervical lacerations dating from former pregnancies may constitute a considerable obstruction to labor.[1] The cicatricial plug in the angle of the tear does not yield like the normal muscular tissue of the cervix. Especially if there is a bilateral tear, the anterior lip becomes œdematous and is squeezed between the advancing head and the symphysis pubis, causing a tedious labor and great suffering. During labor, dilatation should be favored by hot douches and Barnes's dilators. The swollen lip should be pushed back during labor pains, and when sufficient dilatation has been obtained, the forceps should be applied. A recurrence should be avoided by performing trachelorrhaphy when full involution has taken place and before the beginning of a new pregnancy, say at the end of the second month after childbirth. The writer has repeatedly seen the operation followed by new pregnancy and labor, without any difficulty and without recurrence of the tear.

Rigidity.—Apart from conglutination and cicatricial tissue the cervix and os may fail to open in the normal way under the impulse of the uterine contractions. This is called rigidity and is a very common occurrence. In primiparæ we feel the edge of the os sharp and tense as a wire. In pluriparæ the edge often remains as thick as the little finger.

In other words, in the first class the cervix has yielded and is being distended; in the second, it is the cervix itself which does not dilate properly. The condition is most frequently met with in old primiparæ. It is a spastic contraction of the muscle-fibres of the cervix. It is often found after premature rupture of the membranes. The soft elastic wedge formed by the liquor amnii being lost, the cervix itself is pressed between the presenting part and the pelvis, which irritates it. A nervous temperament and fear of pain can also be the cause. Uterine contractions, even if normal, have not the normal effect on the cervix. The condition is so common with a mechanical disproportion that this always is my first thought in looking for a cause. It is as if the uterus had a presentiment of the coming struggle and had not the courage to open its mouth.

---

[1] Garrigues, "Laceration of the Cervix Uteri," Archives of Medicine, October, 1881.

As long as the membranes are intact, the rigidity is of little importance, because the woman and the fœtus are protected by the liquor amnii. But when the waters have broken, it is fraught with danger. The cervix and lower uterine segment are exposed to great pressure. The contused parts are more easily infected, the patient becomes feverish, uterine contractions may cease, or, if they continue, they may injure the cervix. These are indeed the circumstances under which the cervix gives way. Most often the tear is longitudinal. The lateral tears may extend into the parametrium and cause hemorrhage or inflammation of the broad ligaments. In rare cases, the laceration being transverse, the whole end of the cervix is torn off as a ring.

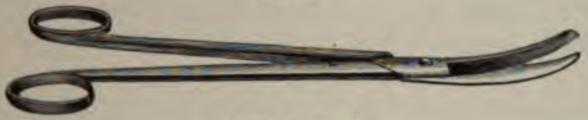
Treatment.—Chloral hydrate, gr. xv (1 gramme), repeated with twenty minutes' interval till two or three doses have been given, is very effective in removing spasm. If the cervix is thick, sulphate of atropine, gr. $\frac{1}{60}$ (1 milligramme), may be injected into it with a hypodermic syringe. A hypodermic injection of morphine, gr. $\frac{1}{6}$ to $\frac{1}{4}$ (from 1 centigramme to 15 milligrammes), is also useful. A rectal suppository containing hydrochlorate of cocaine, gr. $\frac{1}{2}$ (3 centigrammes), is also recommended; if necessary, it may be repeated after an hour and a half. Radix ipecacuanhæ, gr. v every twenty minutes, is somewhat disagreeable on account of the nausea it produces, but it softens the cervix. An entire lukewarm bath soothes the whole nervous system and has sometimes a good effect on the cervix. Large, tepid vaginal douches have a similar effect. If these milder remedies do not suffice, dilatation should be furthered by means of Barnes's elastic dilators and Champetier de Ribes's unyielding pear-shaped bag, which may be pulled through with the hand or an attached weight. Harris's manual dilatation is excellent. (See OPERATIONS.)

There are also different expanding metal instruments.

Personally, I have found the above-mentioned methods sufficient for all purposes, but others use incisions. They may easily be made by inserting a blunt-pointed bistoury through the os, after having covered most of the blade with a strip of muslin. During a pain the edge is turned against the circumference of the os. The incisions may also, and better, be made with a pair of long-shanked, curved, blunt scissors (Fig. 337).

Small incisions of this kind, not extending over a quarter of an inch in depth, and going in four different directions, are sometimes very effective, and there is not much to be said against them, although they may tear somewhat. The hemorrhage is, as a rule, controlled by hot injections. Exceptionally tamponade may be needed. This is an old method and different from *Dührsen's method*, by which two lateral, and sometimes an additional, anterior and posterior incision

FIG. 337.



Cervix-scissors.

are carried all the way out through the vaginal portion to the roof of the vagina.

§ 3. **Obstruction in the Vagina.**—Curiously enough, the accoucheur may find the vagina totally closed by a hymen in which the closest inspection fails to discover any opening. There must evidently have been one, otherwise impregnation could not have taken place; but the opening may be so small that it is discovered only at the time of menstruation, and such a fine opening may become obliterated by an inflammatory adhesion, thus constituting an *imperforate hymen*, or *atresia hymenalis*. During labor the bag of waters presses against the closed hymen, distending it enormously and causing great pain. The hymen should be divided by a crucial incision. There will hardly be any hemorrhage, but if necessary it is arrested with a hot-water douche, application of liquor ferri chloridi, or ligature.

More commonly the hymen has one or more fine openings, but the obstruction in regard to the birth of the child is practically the same as when the membrane is imperforate, and the treatment is the same. A hymen with several fine openings is called a *hymen cribriformis*. In other cases there are two large openings separated by a septum, which nearly always runs in an anteroposterior direction. This is a *hymen septus*. Such a band is generally burst by the advancing fœtus. If not, it is best to tie it at both ends and excise it.

In the vagina proper we may have transverse or longitudinal, more or less complete septa.

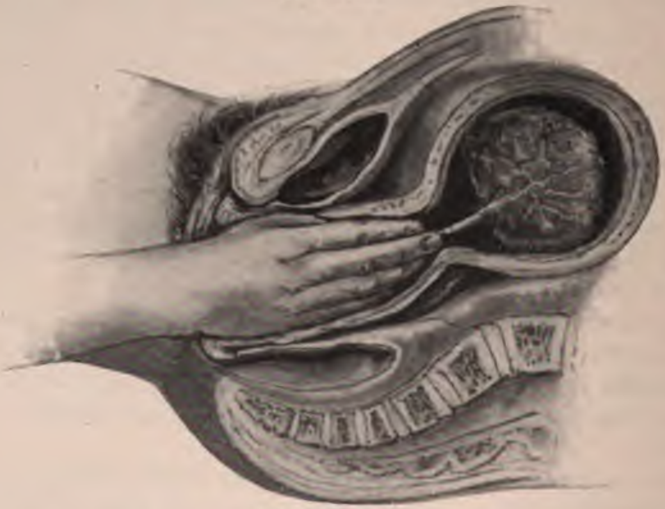
The word *atresia* means a lack of lumen, and ought to be used only in speaking of a complete closure, whereas *stenosis* means narrowness, and may properly be applied to any condition in which the vagina has not its proper width.

A transverse septum with one or more small openings may be found in any part of the vagina, and will present a similar obstacle to that of an imperforate hymen.

The transverse septum may have considerable thickness, the side walls having grown together over a more or less extensive area in

The placenta may have been cast loose, but is retained in the uterine cavity by muscular contraction, especially at the seat of the contraction ring. Authors attribute this frequently to so-called *hour-glass contraction*, but in reality the upper part of the uterus is, as a rule, more or less contracted, and the lower part is decidedly flaccid (Fig. 331). Only the contraction is irregular and strongest at the narrowest part of the uterus. Retention of the placenta used to be much more common when the mode of delivery was to pull on the cord or press directly on the placenta inside the uterus. With the introduction of Credé's expression method retention has become a rare accident. This indicates the prophylactic treatment. The curative treatment, if there is a serious obstruction, consists in administering chloroform and pressing on the contracted ring with the fingers united into a cone around the thumb. But often all that is needed is to follow the cord up to its insertion, wind it around the fingers of the left hand, and press on the placenta with the index and middle finger of the right hand, when the placenta readily yields.

FIG. 331.



Retained placenta.

As it is always preferable not to enter the uterus, and the placenta may come out spontaneously or by expression, the accoucheur should be in no hurry about removing the placenta if there is no hemorrhage. It is the writer's rule to wait an hour before having recourse to any other measures than repeated compression of the fundus.

If the uterus has been entered, it ought also to be washed out with some antiseptic solution, especially lysol or creolin.

Adhesion of the placenta is a much more serious matter than mere retention. It may be total or partial; in the latter case it is mostly found at the periphery, while in the centre the connection with the uterus may be normal. The decidua serotina in the adherent parts has been replaced by tough connective tissue, which extends deep into the muscular coat. This condition is usually due to chronic endometritis. Some women have an adherent placenta in several successive pregnancies. It follows sometimes partial detachment of the placenta during pregnancy. The cause may also be an abnormal structure of the placenta, especially a membranous placenta. The adhesion is most frequently found in the cornua of the uterus, the original site of implantation of the ovum, where the connection may have become more solid, or where villi of the chorion may have grown into the tubes. It is also apt to be found with placenta prævia, where the insertion takes place over the os internum.

Prognosis.—Both retention and especially adhesion of the placenta often give rise to hemorrhage, which may prove disastrous to both mother and child.

Treatment.—The patient is placed on a table and anæsthetized, the legs drawn up and the knees bent. The particularly well-disinfected hand is carried between the membranes and the uterine wall up to the upper margin of the placenta; the fingers are bent and the nails are used as knives to sever the connection between the placenta and the uterus, while this is steadied from without with the other hand. If we cannot obtain a line of cleavage here, we try the sides of the placenta and enter where best we can. It is a great advantage if the placenta can be peeled off in one piece and from above downward. But where the connection with the uterus is very dense this is impossible, and we must be satisfied by removing it piecemeal, which is apt to be accompanied by much more hemorrhage.

Besides the fingers, the large dull wire curette (Fig. 411) and a placenta-forceps with good grip and broad dull ends (Figs. 412, 413) may be needed. If necessary, it is better to leave a little of the placental tissue than to perforate the uterus. When as much as possible has been removed, the uterus is irrigated.

§ 4. **Placenta Prævia.**—The fertilized ovum may become embedded so low down on the wall of the cavity of the uterus that the placenta covers the internal os, or at least that portion of the uterus which must change its position in order to allow the dilatation of the os necessary for the passage of the fœtus. When this dilatation takes place, more or less of the placenta is separated from its connection with the uterus, which process is accompanied by hemorrhage, and will be described together with hemorrhage from other sources.

CHAPTER VIII.

OBSTRUCTIONS IN THE PARTURIENT CANAL.

§ 1. **Displacements of the Uterus.**—PENDULOUS ABDOMEN.—We have seen that, as a rule, anteversion during pregnancy is of little importance when there is an abdominal wall offering normal resistance, which makes the uterus rise to the proper position. But if the abdominal wall is weak, the heavy pregnant uterus falls forward, and it may even tip so much downward that the fundus is in the neighborhood of the knees.

Sometimes there is only an unusual flaccidity of the abdominal wall, but in other cases there is such a diastasis between the recti muscles that the uterus protrudes between them and lies directly under the skin.

Through the altered inclination of the uterus to the pelvis, the os is carried too far up and the presenting part is prevented from engaging.

This condition is due to distention of the abdomen by previous pregnancies or tumors, to laparotomies, or umbilical or ventral hernias. It is also found in primiparæ in consequence of a narrow pelvis which prevents the normal descent of the presenting part into the pelvic cavity during the latter part of pregnancy.

The treatment is similar to that mentioned in speaking of deficient abdominal pressure during labor. The fundus of the uterus is to be raised and kept in place with a tightly adjusted binder.

VENTRAL FIXATION AND VAGINAL FIXATION OF THE UTERUS.—A peculiar artificial antedisplacement of the pregnant uterus has been brought about by the different operations by which the anterior surface and the fundus of the uterus are fastened to the abdominal wall or the vagina.[1] The anterior wall being fastened, the uterus must chiefly grow by expansion of the posterior wall, and the os is carried high up. This unnatural position of the uterus gives rise during the progress of pregnancy to much discomfort, such as a dragging pain at the seat where the uterus has been moored, and excessive nausea and vomiting, and it leads often to abortion. During labor it has prevented engagement, causing inertia and rupture of the uterus, and made delivery impossible by the natural way, so that in several cases Cæsarean section became necessary to bring labor to an end.

Any kind of fixation of the uterus itself should, therefore, be deprecated, and such operations be substituted which shorten or attach the round ligaments, and among these again the preference should be given to those in which the uterus is not unnaturally anteverted or anteflexed.

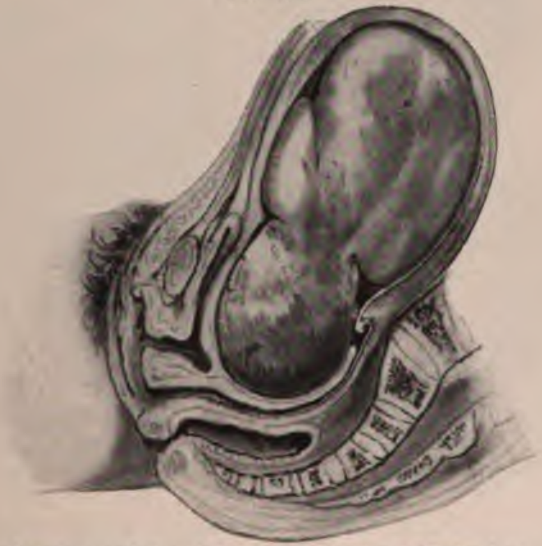
---

[1] Garrigues, Diseases of Women, third ed., p. 473.

LATEROVERSION.—The uterus, in most cases, is tilted more or less to the right side of the abdomen, more rarely to the left. This rarely interferes with labor. If it does, the malposition is easily corrected by placing the patient on the opposite side, when the fundus will sink down towards the couch, and the os move in the opposite direction.

SACCULATION.—If the presenting part, generally the head, presses somewhat unevenly on the lower uterine segment, this will be distended and form a deep pouch, fitting like a hood over the fœtus, while the os remains high up in the vault of the vagina. Most frequently it is the anterior part of the lower uterine segment that undergoes this distention, and the os is, therefore, drawn high up behind the presenting part (Fig. 332) in the neighborhood of the promontory.

FIG. 332.



Anterior sacculation of the uterus. (Tarnier and Budin, l. c.)

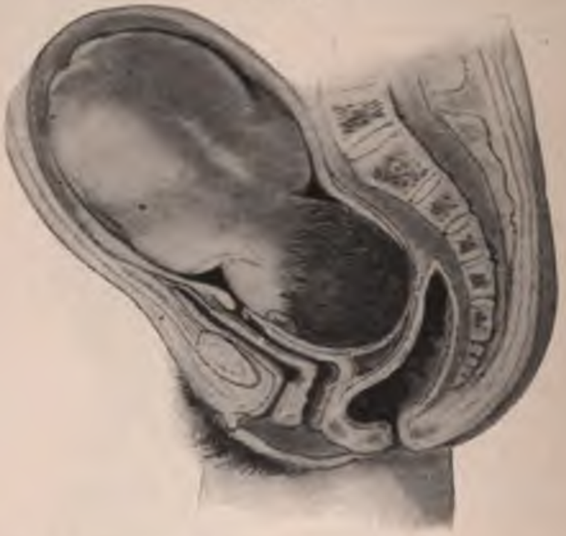
Much more rarely it is the posterior part of the lower uterine segment that forms the sac, while the os is found above the symphysis pubis (Fig. 333). A similar condition has been found with a bicornute uterus, one horn developing in the pelvic cavity and the other in the abdomen.

We have seen that retroflexion, as a rule, corrects itself or is artificially corrected. It happens, however, in rare cases that the replacement is not total, and that a part of the posterior wall of the uterus is retained, while the larger part of it and the whole anterior wall are distended by the growing fœtus. In this kind of cases the labor-pains have not much effect on the os, most of the impetus being spent in distending that part of the lower uterine segment which forms the pouch.

The prognosis is better in anterior sacculation than in posterior. As a rule, the os will open and come lower down. But if the abnormal distention continues, the uterus will rupture.

The diagnosis may be quite difficult. Sacculation has been taken for closure of the os, and an incision has been made in the uterus. It has also been mistaken for a fully dilated os, the distended lower uterine segment being so thin that it was overlooked and the forceps applied outside of it. The pelvic cavity is full, although there is no dilatation. The os is placed at the bottom of a deep pouch formed by the vagina. If it is not within reach of a finger, the whole hand must be introduced during anæsthesia. If the os is in front, something may be gained by placing the patient in the knee-chest position and having her supported by assistants (Fig. 260). In this position the patient rests on her knees, the upper part of the chest, the right side of the face, and the right forearm. The thighs are kept perpendicular, and the back is hollowed. It makes the fundus of the gravid uterus gravitate strongly forward and downward, and consequently brings the os downward and backward.

FIG. 333.



Posterior sacculation of the uterus. (Tarnier and Budin, l. c.)

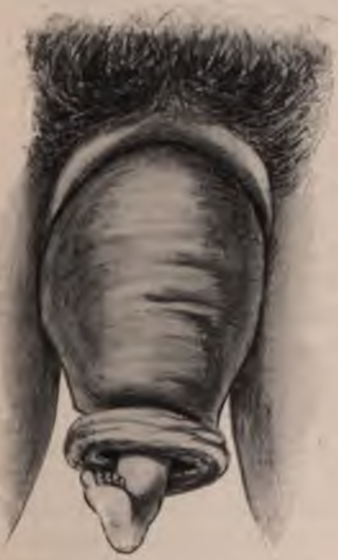
By hooking one or two fingers over the lower border of the os, it is gently pulled down during a uterine contraction, which may be repeated several times, until the os is brought to its normal position. It has been found necessary to make numerous small incisions in the circumference of the os. In another case the fœtus was turned and extracted by the feet, and in one even Cæsarean section was resorted to.

Partial Prolapse.—The whole uterus is never found prolapsed at full term. There may be a prolapse of the lower part of the uterus and the cervix become hypertrophied and œdematous, but the bulk of the uterus is in or above the pelvis. Fig. 334 shows such a prolapse with a protruding foot.

In Fig. 335 is represented a case of head presentation with prolapse and hypertrophy of the cervix.

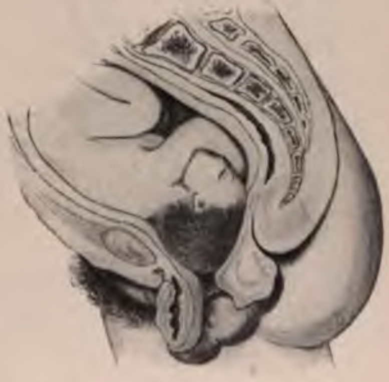
In delivering these cases the uterus should be kept back, while the extraction of the child is made with forceps or hand. That is most readily accomplished by covering the prolapsed part with a piece of muslin with a hole corresponding in size to the os.

Fig. 334.



Partial prolapse of uterus with protruding foot. (Wagner.)

Fig. 335

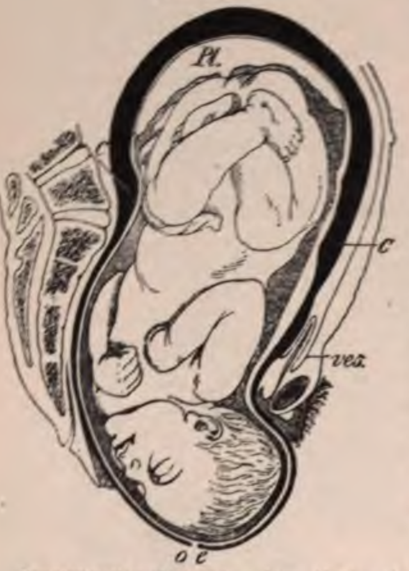


Prolapse and hypertrophy of the cervix with head presentation. (Faivre.)

Uterine Hernia.—The whole pregnant uterus at term has been found in inguinal and more rarely in femoral hernia. A unicorn or bicornute uterus is predisposed to this displacement. The best treatment is to cut down on the uterus, open it as in Cæsarean section, and then amputate it.

§ 2. **Abnormalities of the Cervix.**—Conglutination of the External Os.—It has been contended that after conception the os may become closed by agglutination of its circumference. Perhaps this is a mistake. By careful searching a small opening is found in which hangs a drop of mucus, which is surrounded by a narrow red ring of the cervical membrane and which admits a uterine sound. If this holds good in all cases, there would then not be an agglutination, but a resistance to opening of the os, a rigidity. The fœtus is pushed into the cervical canal, which becomes enormously distended and as thin as a sheet of paper. The head may even be expelled from the genitals covered by the cervix (Fig. 336).

Fig. 336.



Conglutination of the external os. (Jentzen.) Head covered by cervix expelled from genitals. *Pl*, placenta; *C C*, contraction ring; *ves.*, bladder; *oe*, external os.

If there is a real agglutination, it must be due to a mild degree of inflammation. If there is none, the resistance has been attributed to a congenital elongated cervix or to density of the cervical tissue due to chronic inflammation.

It may be impossible to feel the os. The patient should then be put in Sims's position and the vagina exposed with Sims's speculum and Garrigues's retractor. When the os is found, it suffices often to press on it with a finger, metal catheter, or uterine sound to make it open rapidly, which would favor the theory of a real agglutination having taken place. In other cases the cervix retracts slowly, and has to be pushed open with repeated introduction of the sound and pressure on the ring or by pulling it apart with the fingers as in Harris's method of dilatation. (See Operations, Fig. 422.) If the os is really closed and does not yield to pressure, it must be opened by making a small crucial incision over it, or if it cannot be found, over the most declive place. Before deciding on these somewhat risky procedures, the accoucheur should satisfy himself that it is not a case of sacculation with the os placed high up in front or behind.

Closure of the Cervical Canal.—The cervical canal may become closed after conception has taken place, either partially, especially at the os, or in its whole length by formation of cicatricial tissue. This may be due to catarrh or ulceration of the cervix, but is more frequently due to the treatment of these conditions with caustics or to operations such as trachelorrhaphy, amputation of cervix, etc.

During labor the fœtus can descend only as far as the obstruction. If uterine contractions do not suffice to overcome it, the accoucheur must remove it, if possible, by means of a sound, but if he does not succeed with a blunt instrument, he must have recourse to sharp ones. The cervix must be perforated with a curved trocar, and perhaps, besides that, incised in four directions. It is safer to make multiple shallow incisions than one or two deep ones.

STENOSIS OF CERVIX.—The cervical canal may be narrow, either from congenital malformation or inflammation and the formation of cicatrices. In these cases the efforts of nature may be assisted by the use of Barnes's and Champetier de Ribes's dilators.

OLD CERVICAL LACERATIONS.—Cervical lacerations dating from former pregnancies may constitute a considerable obstruction to labor.[1] The cicatricial plug in the angle of the tear does not yield like the normal muscular tissue of the cervix. Especially if there is a bilateral tear, the anterior lip becomes œdematous and is squeezed between the advancing head and the symphysis pubis, causing a tedious labor and great suffering. During labor, dilatation should be favored by hot douches and Barnes's dilators. The swollen lip should be pushed back during labor pains, and when sufficient dilatation has been obtained, the forceps should be applied. A recurrence should be avoided by performing trachelorrhaphy when full involution has taken place and before the beginning of a new pregnancy, say at the end of the second month after childbirth. The writer has repeatedly seen the operation followed by new pregnancy and labor, without any difficulty and without recurrence of the tear.

RIGIDITY.—Apart from conglutination and cicatricial tissue the cervix and os may fail to open in the normal way under the impulse of the uterine contractions. This is called rigidity and is a very common occurrence. In primiparæ we feel the edge of the os sharp and tense as a wire. In pluriparæ the edge often remains as thick as the little finger.

In other words, in the first class the cervix has yielded and is being distended; in the second, it is the cervix itself which does not dilate properly. The condition is most frequently met with in old primiparæ. It is a spastic contraction of the muscle-fibres of the cervix. It is often found after premature rupture of the membranes. The soft elastic wedge formed by the liquor amnii being lost, the cervix itself is pressed between the presenting part and the pelvis, which irritates it. A nervous temperament and fear of pain can also be the cause. Uterine contractions, even if normal, have not the normal effect on the cervix. The condition is so common with a mechanical disproportion that this always is my first thought in looking for a cause. It is as if the uterus had a presentiment of the coming struggle and had not the courage to open its mouth.

---

[1] Garrigues, "Laceration of the Cervix Uteri," Archives of Medicine, October, 1881.

As long as the membranes are intact, the rigidity is of little importance, because the woman and the fœtus are protected by the liquor amnii. But when the waters have broken, it is fraught with danger. The cervix and lower uterine segment are exposed to great pressure. The contused parts are more easily infected, the patient becomes feverish, uterine contractions may cease, or, if they continue, they may injure the cervix. These are indeed the circumstances under which the cervix gives way. Most often the tear is longitudinal. The lateral tears may extend into the parametrium and cause hemorrhage or inflammation of the broad ligaments. In rare cases, the laceration being transverse, the whole end of the cervix is torn off as a ring.

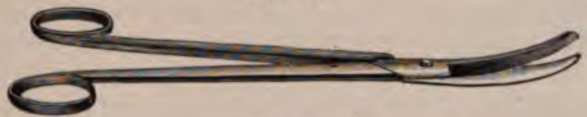
Treatment.—Chloral hydrate, gr. xv (1 gramme), repeated with twenty minutes' interval till two or three doses have been given, is very effective in removing spasm. If the cervix is thick, sulphate of atropine, gr. $\frac{1}{60}$ (1 milligramme), may be injected into it with a hypodermic syringe. A hypodermic injection of morphine, gr. $\frac{1}{6}$ to $\frac{1}{4}$ (from 1 centigramme to 15 milligrammes), is also useful. A rectal suppository containing hydrochlorate of cocaine, gr. $\frac{1}{2}$ (3 centigrammes), is also recommended; if necessary, it may be repeated after an hour and a half. Radix ipecacuanhæ, gr. v every twenty minutes, is somewhat disagreeable on account of the nausea it produces, but it softens the cervix. An entire lukewarm bath soothes the whole nervous system and has sometimes a good effect on the cervix. Large, tepid vaginal douches have a similar effect. If these milder remedies do not suffice, dilatation should be furthered by means of Barnes's elastic dilators and Champetier de Ribes's unyielding pear-shaped bag, which may be pulled through with the hand or an attached weight. Harris's manual dilatation is excellent. (See OPERATIONS.)

There are also different expanding metal instruments.

Personally, I have found the above-mentioned methods sufficient for all purposes, but others use incisions. They may easily be made by inserting a blunt-pointed bistoury through the os, after having covered most of the blade with a strip of muslin. During a pain the edge is turned against the circumference of the os. The incisions may also, and better, be made with a pair of long-shanked, curved, blunt scissors (Fig. 337).

Small incisions of this kind, not extending over a quarter of an inch in depth, and going in four different directions, are sometimes very effective, and there is not much to be said against them, although they may tear somewhat. The hemorrhage is, as a rule, controlled by hot injections. Exceptionally tamponade may be needed. This is an old method and different from *Dührsen's method*, by which two lateral, and sometimes an additional, anterior and posterior incision

FIG. 337.



Cervix-scissors.

are carried all the way out through the vaginal portion to the roof of the vagina.

§ 3. **Obstruction in the Vagina.**—Curiously enough, the accoucheur may find the vagina totally closed by a hymen in which the closest inspection fails to discover any opening. There must evidently have been one, otherwise impregnation could not have taken place; but the opening may be so small that it is discovered only at the time of menstruation, and such a fine opening may become obliterated by an inflammatory adhesion, thus constituting an *imperforate hymen*, or *atresia hymenalis*. During labor the bag of waters presses against the closed hymen, distending it enormously and causing great pain. The hymen should be divided by a crucial incision. There will hardly be any hemorrhage, but if necessary it is arrested with a hot-water douche, application of liquor ferri chloridi, or ligature.

More commonly the hymen has one or more fine openings, but the obstruction in regard to the birth of the child is practically the same as when the membrane is imperforate, and the treatment is the same. A hymen with several fine openings is called a *hymen cribriformis*. In other cases there are two large openings separated by a septum, which nearly always runs in an anteroposterior direction. This is a *hymen septus*. Such a band is generally burst by the advancing fœtus. If not, it is best to tie it at both ends and excise it.

In the vagina proper we may have transverse or longitudinal, more or less complete septa.

The word *atresia* means a lack of lumen, and ought to be used only in speaking of a complete closure, whereas *stenosis* means narrowness, and may properly be applied to any condition in which the vagina has not its proper width.

A transverse septum with one or more small openings may be found in any part of the vagina, and will present a similar obstacle to that of an imperforate hymen.

The transverse septum may have considerable thickness, the side walls having grown together over a more or less extensive area in consequence of sloughing in typhoid fever, diphtheritic ulcers, or cauterization. Such a barrier must be divided with incision when distended by the presenting part, and even Cæsarean section may be required.

The vagina may be divided into two halves, each corresponding to one of the Müllerian ducts from which it is developed. Commonly, but not always, the *double vagina* is combined with a double uterus.

Instead of a full-length partition, there may be found only a more or less narrow band, which latter oftener causes dystocia than the former, this being apt to burst under the pressure of the advancing fœtus. If it does not, it must be severed, preferably with thermo- or galvanocautery. A band is simply cut with scissors, or preferably tied at both ends and removed.

There may be a general *narrowness* of the vagina, either congenital or acquired by cicatrization. Cicatrices soften, however, remarkably during pregnancy, so that often they do not impede labor. If necessary, room should be procured by longitudinal incisions, which cause less injury than the incalculable tears resulting from over-distention. Sometimes the forceps is used to advantage.

Vaginism[1] has in rare cases interfered with labor, a trouble that is easily remedied by anæsthetizing the patient.

§ 4. Diseases of the Vulva.—NARROWNESS.—The vulva may be congenitally too small or rigid or narrowed by cicatrices due to burns, cauterization, or ulceration. The perineum may be too long, either congenitally or in consequence of operations for the repair of lacerations sustained in former labors. The lack of space or elasticity is often attributable to tender or advanced age in primiparæ.

This narrowness or rigidity of the vulva often leads to laceration.

Prophylaxis.—Much may be done in order to prevent or limit these injuries, as will appear later on when we come to treat of the laceration of the perineum.

If no other means seem sufficient to prevent laceration, it may sometimes be done by the operation called *episiotomy.*

If the indication for the operation is too small dimensions or rigidity, an incision should be made on either side about half an inch from the median line, behind the orifice of the duct of Bartholin's gland, and carried about one-half or three-quarters of an inch in the direction of the tuberosity of the ischium. These incisions are best made with a pair of curved scissors.

If incisions are to be made on account of cicatricial tissue, it is best to use a bistoury and make several incisions right into the constricting part.

---

[1] Garrigues, Diseases of Women, third ed., p. 375.

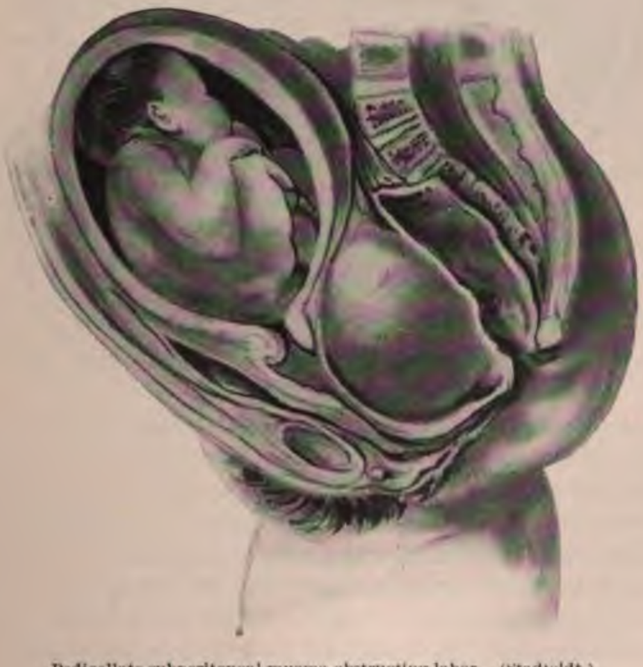
ŒDEMA OF THE VULVA may be found combined with œdema of the lower extremities in consequence of local pressure or as a sequel of albuminuria. It may lead to deep laceration or consecutive gangrene. Perhaps simple digital compression of the labia majora will relieve the swelling. If not, the labia should be scarified so as to give an exit to the pent-up serum.

An ABSCESS OF BARTHOLIN'S GLAND is hardly large enough to obstruct labor, but, as it is nearly always of gonorrhœal origin and contains a danger of infection, it should be laid open by an incision extending over its whole length, washed out, swabbed with undiluted carbolic acid followed by alcohol, and packed with iodoform gauze.

GANGRENE OF THE VULVA is very rare, but might offer a resistance to normal dilatation. If not too extensive, it should be cut out and the wound treated with carbolic acid, alcohol, and styptic cotton. If extensive it might induce the accoucheur rather to perform Cæsarean section than to run the risks of deep tears and dangerous infection.

§ 5. **Uterine Tumors.**—MYOMA.—The importance of myomatous tumors as a cause of dystocia varies much with their size and seat.

FIG. 338.

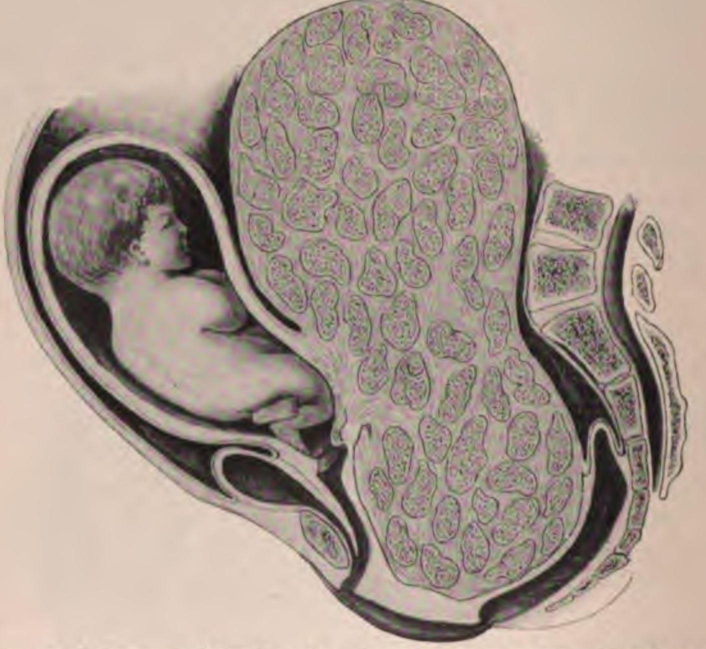


Pedicellate subperitoneal myoma obstructing labor. (Stadfeldt.)

Small myomas in the upper part of the uterus are common and do not in any way interfere with labor. Sometimes they are taken for small parts of the fœtus, but the latter are movable, while the former are stationary in the uterine wall. The subperitoneal are generally less dangerous than the interstitial or submucous fibroids.[1] But they may be so large that they interfere with uterine contraction, or, if they are pediculate, they may sink down into the pelvis ahead of the fœtus (Fig. 338).

The intramural and submucous may prevent contraction after the birth of the child and become the cause of severe post-partum hemorrhage. Pedunculated submucous myomas—so-called fibrous polypi—may descend ahead of the fœtus and prevent its progress, but sometimes the pedicle tears and the tumor is expelled. Myomas frequently give rise to pelvic or transverse presentation or to placenta prævia. In the puerperium they sometimes become gangrenous. The greatest danger arises, however, when the tumor has its seat in the cervix, prevents engagement, or even fills the whole pelvic cavity (Fig. 339). Such a case has some resemblance to a sacculated uterus, but the vaginal tumor differs from a fetal head or breech by its nodular structure without bones. The abdominal part of a tumor has a similar

FIG. 339.



Retrocervical fibromyoma filling the pelvis. Cæsarean section at term. (Spiegelberg.)

---

[1] Garrigues, Diseases of Women, third ed., p. 494.

build and can be differentiated by its hardness from the elastic uterus containing the liquor amnii and the fœtus.

During pregnancy myomas grow; but at the same time they become softer, a point well to be remembered, since it may allow the fœtus to pass or enable the accoucheur to push them out of the way. If neglected, they may lead to rupture of the uterus or death by exhaustion. For the child the prognosis is also very doubtful.

These cases must be watched and examined most carefully, and mostly demand some kind of assistance. Still, cases that filled the accoucheur with anxiety during pregnancy have terminated by an undisturbed normal delivery. The best way is, therefore, generally speaking, if pregnancy has not been interrupted, to await developments at the time of labor.

First of all the accoucheur will try to bring an obstructing tumor from the pelvis up into the abdominal cavity, in which respect the above-mentioned softening is very valuable. The reposition may be considerably facilitated by placing the patient in Sims's or the genu-pectoral position. It may be necessary to introduce four fingers or the whole hand into the vagina. If it is an internal pedunculated tumor that is in the way, he should try to get hold of it with a fillet or a volsella and cut the pedicle. An excellent instrument for this purpose is Thomas's spoon-saw, which by crushing the tissue prevents hemorrhage. If this instrument is not available, Bozeman's strongly curved scissors may be used.

If the tumor is situated in the cervix and does not go so high up that its upper end is beyond reach, the tumor should be seized at its lowest part and enucleated.[1]

If a fibroid of moderate size, situated in the lower uterine segment, prevents engagement, version may be resorted to, which gives better chance than the forceps, the obstruction being so high up. But if there is a partial engagement, the forceps may be tried. If there is not room enough for the undiminished fœtus to pass, perforation may be needed.

If the pelvis is filled by an immovable mass, Cæsarean section is indicated. If the fœtus lies in front of the womb as in Fig 339, it is safest to close the uterus, and leave the question about hysterectomy till after the end of the puerperium; but if in order to get at the fœtus we must cut or enucleate tumors, it will be necessary to remove the uterus by supravaginal amputation, or, if the cervix is implicated, perhaps even total extirpation.

After the birth of the child the uterus must be carefully compressed, and if there is any hemorrhage injection with hot water or styptic fluids should be made into the uterine cavity.

---

[1] Garrigues, Diseases of Women, third ed., p. 505, Figs. 290, 291, p. 508.

CARCINOMA.—We have said above (p. 294) that if a woman affected with cancer of the womb is seen during pregnancy, the uterus should be removed. If the case does not come under observation before labor has begun and the fœtus is living, it is better for the mother if deep incisions are made in the cervix and the child delivered through the vagina by means of version, rarely with forceps. If cancerous masses are in the way, they must be scraped off, and, as there is considerable hemorrhage, a thermocautery should be kept ready.

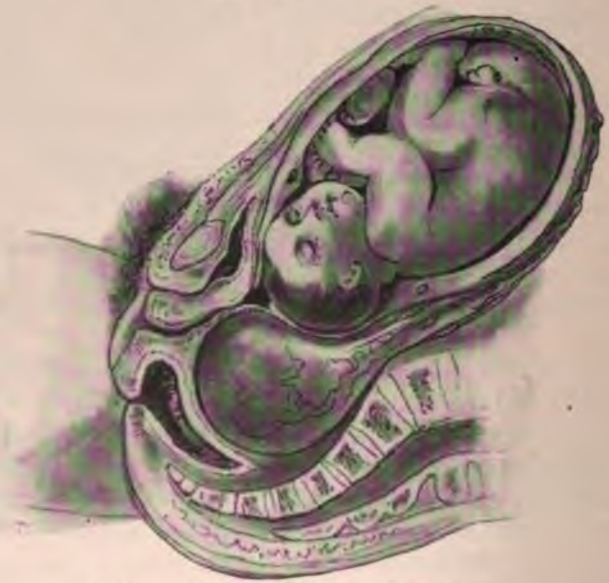
It may also be taken under consideration to perform simple Cæsarean section, but. if the cervix is somewhat dilated and not too rigid and the fœtus not too large, the chances for the mother are better by vaginal extraction.

The Cæsarean section may be followed by total extirpation, if the case is operable. Finally, both delivery and extirpation may be performed from the vagina,—so-called *vaginal Cæsarean section.* (See OPERATIONS.)

If the fœtus is dead craniotomy should be performed and the fœtus extracted.

§ 6. **Ovarian Tumors.**—We have seen above (p. 296) that, unlike uterine myomas, ovarian tumors, as a rule, demand interference during pregnancy. During labor they offer a twofold danger. Either they may, on account of their large size, cause such an obliquity of the

FIG. 340.



Head arrested at brim by an ovarian cyst.

uterus that engagement of the fœtus becomes difficult or impossible; or, if small, they may enter the pelvic cavity ahead of the fœtus (Fig. 340). This is most frequently the case with the slow-growing dermoid cysts. The tumor descends generally behind the vagina in the posterior part of the pelvis. It may be cystic or solid, movable, impacted, or bound down by adhesions.

If a large tumor prevents engagement and it is cystic, the best way is to tap it. If it is solid or semisolid and does not collapse, it must be removed by ovariotomy. If an ovarian tumor obstructs the vagina, we may try to replace it manually like a pedicellate myoma. If the replacement prove impossible, the accoucheur should tap the tumor through the posterior vaginal wall. But if it is solid and cannot be replaced, ovariotomy must be performed, and under these circumstances the abdominal section is preferable to the vaginal.[1]

§ 7. **Other Abdominal Tumors.**—Tumors of the other abdominal organs, as the liver, pancreas, spleen, kidneys, mesentery, omentum, the broad ligaments, etc., have in rare cases caused dystocia. The difficulties are much like that caused by ovarian cysts, and similar principles are followed in the treatment.

The one that has been observed most frequently is an ECHINOCOCCUS, either abdominal or pelvic. Labor may end spontaneously, but, as a rule, some surgical interference is needed, especially puncture, application of forceps, manual extraction, or even the Cæsarean section. These cases have been marked by a great maternal mortality (thirty per cent.).

HÆMATOCELE and CYSTIC SALPINGITIS rarely cause obstruction, but if they rupture, especially if the contents are purulent, the situation may be most serious.

§ 8. **Vaginal and Vulvar Tumors.**—True vaginal tumors—that is to say, such as originate in the vaginal wall—are rare, and rarely oppose an obstruction to labor. Large CYSTS have had to be punctured to give passage for the fœtus. FIBROIDS or CARCINOMA may have to be extirpated or diminished. VEGETATIONS are usually soft, but may be large enough to form an obstruction, which should be removed with a thermo- or galvanocautery.

In another sense vaginal tumors are quite common—namely, such as, starting from other organs, either hang free in the vagina—for instance, a polypus of the cervix uteri (Fig. 341)—or bulge into the lumen of the vagina, carrying its wall before them,—*e.g.*, uterine fibroids, ovarian tumors, or swellings formed by the bladder or the rectum.

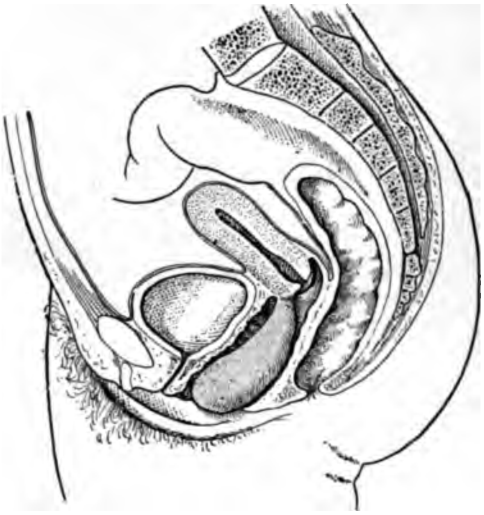
HERNIA.—Herniæ do not form a real obstruction, but there is danger of their impaction and compression, which may lead to rupture or gangrene of the intestine. *Crural* hernia is least exposed, but *inguinal* hernia descending into the labium majus and forming an *anterior*, or *inguinolabial*, hernia, may be exposed to much pressure. This applies still more to *vaginal hernia*, or *vaginal enterocele*, which follows the course of the vagina. It most frequently starts from Douglas's pouch, more rarely in front between the uterus and the bladder. It may extend into the labium majus from behind, forming a *posterior labial* hernia, or *vaginolabial* hernia.

---

[1] Garrigues, Diseases of Women, third ed., p. 641.

The *diagnosis* is made by reducing the hernia through the opening by which it has escaped, and this is also the mode of *treatment*. Taxis should be exercised in the intervals between contractions, and once replaced the hernia should be kept back with the hand until the child is born. In vaginal hernia the reposition should be performed in the genupectoral or elevated pelvis position and the intestine kept in until the presenting part has descended far enough to close the opening. If a hernia cannot be replaced by taxis, labor should be terminated as soon as possible by version or forceps.

Fig. 341.



Fibrous polypus of cervix occupying the vagina. (Tolson.)

The bladder may be the cause of dystocia in different ways. Simple *retention of urine* interferes with the proper contraction of the uterus, and a full bladder may become the cause of the formation of a vesicovaginal fistula, when the base of the bladder is compressed between the head and the pelvis. The remedy is, of course, to empty the bladder, but this is not always easy. A common female catheter is too short to be of avail. A soft-rubber catheter may, perhaps, worm its way in, but it may also meet a resistance which, on account of its very flexibility, it is unable to overcome. Then a male metal catheter, especially one of soft metal, which can be bent, is the instrument to use. Often it can be introduced by simultaneously pushing back the presenting part.

Cystocele forms a soft, fluctuating tumor on the anterior wall of the vagina. The urine should be drawn and the prolapse kept back until the presenting part has passed.

Calculus.—A stone in the bladder has in a number of cases caused dystocia. It may prevent the progress of the fœtus or it may injure the bladder, causing a vesicovaginal fistula. If possible, the stone should be pushed up above the symphysis. If not, an incision may be made in the median line, the stone extracted, and the edges united by suture after delivery. If the stone is not too large, the child may, perhaps, be pulled past it with forceps or hand. It would hardly be right under such circumstances to perform craniotomy on the living child; but if the child is dead, that is the proper thing to do. If the patient is seen during pregnancy, a small stone may be pulled out through the dilated urethra, and a larger crushed by litholapaxy, and thus the danger during labor be averted.

THE RECTUM may encroach upon the vagina. As with the bladder, a simple accumulation of fecal matter, forming large, hard scybala, may form a real obstacle to labor. The case is aggravated if there is a prolapse of the posterior wall of the vagina, forming a pouch into which the distended rectum descends. The treatment consists, of course, in the removal of the obstructing fæces, which may be quite difficult. The best way of obtaining a speedy softening of the scybala is to inject half an ounce of glycerin, break the mass up with the index-finger, and scoop it out with a teaspoon. When the rectum is free, the prolapsed vaginal wall is pushed up and the child extracted with forceps.

Carcinoma of the rectum is not a rare disease, but it does not often form so large a tumor as to interfere with the passage of the fœtus. In exceptional cases extraction has been made with the forceps, the head has been perforated, or Cæsarean section has been performed. In deciding on the last two operations, the degree of development of the cancer, the mother's general health, and the chances of a subsequent operation should all be weighed. It would not be right to sacrifice a living child in the interest of a mother doomed shortly to die after a period of great suffering.

CHAPTER IX.

DEFORMITIES OF THE PELVIS.

THE pelvis may be too small, too large, or irregular, the irregularity being due either to deviation of the bones or to tumors springing from them.

The too small pelvis is generally called a *narrow* or *contracted* pelvis. The narrowness may be found at the upper brim alone, or at least preponderatingly, or else in all the transverse planes which we may imagine laid through the pelvis. It may be found in only one diameter or in all. The brim and the anteroposterior diameter are by far the most common seat of the narrowness.

It is somewhat difficult to give a precise definition of what constitutes a narrow pelvis. We cannot go by the character of the labor alone, because here three factors are concerned,—the size of the pelvis, the size of the child, and the strength of the expulsive force. We see often an easy labor in decidedly contracted pelves, and the same woman may in one pregnancy have an easy confinement and in another a difficult one.

It has, then, been decided to go by the measurements of the pelvis, and according to some great obstetricians every pelvis the true conjugate of which measures 3½ inches (9 centimetres) or less is looked upon as narrow, because experience has shown that in such pelves generally there will not be room enough for the passage of the fœtus, or a faulty presentation will be found. Since the normal distance is 4¼ inches (11 centimetres), it is evident that this excludes many minor degrees of contraction, which occasionally may give rise to dystocia, especially if at the same time there is some contraction of the transverse and oblique diameters, or if there is some weakness in the expellant forces.

The narrowness has again been subdivided into three degrees, placing the points of demarcation between the different degrees at 3¼ inches and 2 inches (8 and 5 centimetres), the slightest degree of contraction being the field for the forceps or version, the medium degree leaving the choice between craniotomy and Cæsarean section, and the highest degree being an absolute indication for the Cæsarean operation; but these rules date from a time when we had less perfect instruments for the extraction of the fœtus, when the Cæsarean section in its old shape was attended by such a mortality that it nearly amounted to an execution, and when symphyseotomy had not been revived. With the improvement in management and technique, capital operations are resorted to nowadays under very different circumstances from those prescribed in the first half of the nineteenth century. Still, these figures may be worth retaining in the memory, since they may be of some value in discussing the treatment to be adopted in cases of contracted pelvis.

Frequency.—There obtains the greatest variety in the frequency with which contraction of the pelvis is said to be found. Thus Stadfeldt, in the Royal Lying-in Hospital, of Copenhagen, Denmark, found only 3 per cent. in a thousand patients whose pelves were accurately measured, and counting as narrow all pelves the diagonal conjugate of which measured 4¼ inches (10.5 centimetres) or less, instead of 5 inches (13 centimetres). In German lying-in hospitals the percentage varied between 7.9 per cent. and 24.3 per cent.

In Austria it varied between 2.15 and 7.8 per cent.

In the city of Paris three observers found respectively 16 per cent., 8 per cent., and 5 per cent., which shows how little reliable their statistics must be.

In America we find a similar discrepancy:

Obstetrician.	Number of Cases.	Percentage of Narrow Pelves.
Whitridge Williams, Baltimore	1,000	13.1
Crosse, St. Louis	800	7.
Reynolds, Boston	2,127	1.13
Flint, New York	10,233	1.42

But by closer examination the difference is to some extent made comprehensible.

In Baltimore there is a large negro population, and Dr. Williams has found that the black women have nearly three times as often contracted pelves as the white women,—black 19.83 per cent., white 7.24 per cent. Furthermore, Dr. Williams measures the diagonal conjugate without reducing it to the true conjugate by subtracting more or less according to height and inclination of the symphysis pubis. So did Stadfeldt, but his limit was placed at 10.5 centimetres, while Williams looks upon every pelvis as contracted that has a diagonal conjugate of 11 centimetres or less, and in the generally contracted he places the limit at 11.5 centimetres or less. This will, of course, considerably increase his number of flat pelves. It is therefore also well worthy of attention that two-thirds of his patients had spontaneous labors.

On the other hand, Dr. Reynolds counted as contracted only those pelves that offered a marked obstruction to the passage of the fœtus and required operative interference.

Dr. Flint examined the records of the Lying-in Society of New York, and only 9 per cent. of the patients were Americans, 75 per cent. were Russians, and the others were Poles and Bohemians. His statistics, therefore, concern chiefly the Slavonic races, and it is known from the statistics of Russian lying-in institutions that contracted pelves are rare there.[1]

I have so much less reason to doubt the accuracy of the measurements taken in Copenhagen, as my personal experience in New York Maternity during a period of eleven years as visiting obstetric surgeon has taught me that contraction of the pelvis is rare in this locality. I have no statistics to offer, and we took as routine practice only the three outer measurements,—the distance between the anterior superior spines of the ilium, the crest of the ilium, and the external conjugate. The internal conjugate was only taken when, from the external measurements or the course of labor, we had reason to believe the patients had a narrow pelvis. On the other hand, according to the by-laws of the hospital every single case in which a pelvis caused dystocia came under the personal examination and treatment of the visiting obstetric surgeon. Obstruction to labor due to contracted pelvis was exceedingly rare. This is partly accounted for by the nationality of the patients, nearly all being born Americans or Irish.

With the increasing immigration from Italy, Bohemia, Hungary, and Russia, I do not doubt that bad cases of pelvic contraction will become more common. In Europe the locality—that is, the social status of the patients and some unknown climatic influence—causes also marked differences in the frequency with which narrow pelves occur. Thus in English manufacturing towns rickets are common among the underfed women of the laboring class. On the borders of the beautiful Rhine, where everything bears witness to the wealth of the population, and in the fertile Lombard plain in Northern Italy, osteomalacia is not rare and furnishes the most distorted pelves.

We must remember that difficult cases of labor are found mostly among the poor, and are therefore apt to gravitate in comparatively large number to lying-in asylums. Among the well-to-do in private practice the narrow pelvis is much rarer than in public institutions.

Etiology.—The cause of pelvic contraction is nearly always developmental; much more rarely the narrowness is acquired later in life. We have seen (p. 144) how the fetal pelvis is changed into that of the adult. Three chief factors are at work,—the weight of the upper part of the body, the resistance offered by the strong pelvic ligaments, and the pressure of the femora against the acetabulum. When all these forces are in harmony, the result is the change from the form of the pelvis of the child to the normal shape of the pelvis of the adult; but if the harmony is disturbed by preponderance of one over the others, the configuration of the pelvis is vitiated.

---

[1] Whitridge Williams, Obstetrics, May, 1899, vol. i., No. 5, pp. 242–253.

There may be an hereditary predisposition to narrowness of the pelvis. Thus it is not rare to find the same form of pelvis in mother and daughter. Among congenital defects that may cause contraction may be named rickets, dislocation of one or both femora, split pelvis, club-foot, flat-foot, etc. During childhood rickets is the chief disease that leads to a narrow pelvis. More rarely coxitis causes unequal pressure from the two lower limbs, or tuberculosis of the vertebral column causes a collapse obstructing the pelvis, or deviations of the vertebræ cause a change in the direction of pressure from above.

In adult life the form of the pelvis may be changed through injury, osteomalacia, or the formation of tumors.

Diagnosis.—The diagnosis of a contracted pelvis in the higher degrees or of unusual forms is an easy matter, but the minor degrees, which still may cause considerable dystocia, are not easily recognized, and the accoucheur should therefore avail himself of every means of ascertaining as much and as early information as possible about his patient, for here the old saying holds good, "forewarned is forearmed." The knowledge of the presence of a narrow pelvis in a patient often enables him to avert evil, or to prepare himself to meet the difficulties that may be expected during labor.

The history of the case is not without value. If the patient has borne children before, she may be able to tell whether the labor lasted unusually long, whether instruments were used, whether the children were born alive or some destructive operation was performed, and whether they were born by the natural passage. Perhaps the patient was told at the time that she had a narrow pelvis. She may know if there were any wounds on the heads of the children when they were born, and, if they are alive, they may still have depressions in places on the skull. We inquire about the woman's general health, especially in childhood, whether or not she began to walk at the usual age, and whether she has had any affection of the bones or joints. Next, the accoucheur should ask if she knows what kind of labors her mother had.

The appearance of the patient may give some information. If she is of unusually small size, that will make it likely that she has a small pelvis. If her hips do not bulge out as in the normal woman, but approximate the male type, and if she is too flat in the sacral region, we may expect to find a narrow pelvis. Deviations of the spinal column and a halting gait are of great importance. A pendulous abdomen in a primipara is also suspicious.

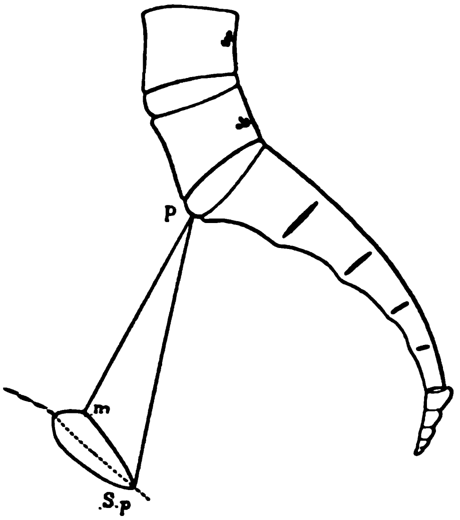
While the history and the general appearance thus may make us surmise that we may have to deal with a contracted pelvis, the exact knowledge of the presence of such deformity, its type, and degree, can be ascertained only by exact external and internal physical examination. We have already described the common way of examining the pelvis with the pelvimeter (pp. 115–117) and the hand.

The external pelvimetry is of minor importance. Of the three measurements it furnishes, that of Beaudelocque's diameter is the most valuable. But in order to ascertain by its means the size of the internal true conjugate, we ought to be able to subtract the thickness of the bones, fat, and skin that make up the difference in length between the internal and the external conjugate, and that is impossible to measure and hard even to approximate. It has therefore been decided to subtract the average thickness, which is 3½ inches, in order to calculate the inner diagonal. The normal measure being eight inches, that leaves four and one-half for the true conjugate in the normal pelvis, which is rather too much, since the average true conjugate is only four and one-quarter inches, and the available conjugate is only four inches. We, therefore, come nearer the truth by dividing the external conjugate into two halves, and counting on one-half its length as what we may expect the available conjugate to be; but the calculation is too unreliable for practical use, and has given way to that based on the length of the diagonal conjugate found by internal pelvimetry.

The relation between the external transverse measurements of the false pelvis—the distance between the anterior superior spines and the crests of the ilium—and the length of the transverse diameter of the brim of the true pelvis is still less constant. Still, with all their imperfections the measurements of the false pelvis furnish us with information not to be despised. If all the measurements are below the normal standard, there is a strong presumption that the true pelvis is also generally contracted. Of still greater value is the proportion between the length of the distance between the anterior superior spines of the ilium and that between the crests of the ilium. If the former is as long as or longer than the latter, the pelvis is rickety. If the distance from one posterior superior spine to the iliopectineal eminence of the other side is considerably longer than the corresponding distance on the other side, it proves that the pelvis is obliquely contracted.

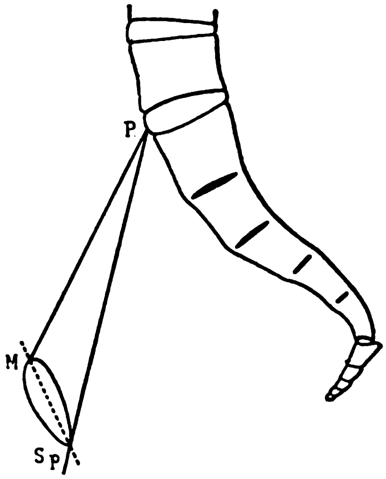
Of much greater importance is the internal examination of the pelvis, when the fingers come in direct contact with the walls of the canal we want to examine. We have described above (p. 115) how the diagonal conjugate is measured, and stated that its average length is five inches. But what we really are interested in is the length of the true conjugate, or rather of the available conjugate, and the question is how we can deduct one from the other. A glance at Figs. 342–344 will show that the available or minimum diameter forms a triangle with the symphysis pubis and the diagonal conjugate, and that the proportion between the length of the available and the diagonal depends on four factors: first, the inclination of the symphysis; second, the height of the symphysis; third, the thickness of the symphysis; and fourth, the height of the promontory. The greater the inclination of the symphysis is, the less difference there will be between the two long sides of the triangle. The higher and thicker the symphysis is, the greater the difference will be. The higher the promontory is situated above the symphysis, the less the difference will be. In examining a pelvis the accoucheur may weigh all these points in his mind, and they will have some influence in deciding how much he should subtract from the length of the diagonal conjugate in determining the length of the available diameter. But by examining a large number of dry pelves it has been found that the subtraction of five-eighths of an inch (fifteen millimetres) gives the least error.

Fig. 342.



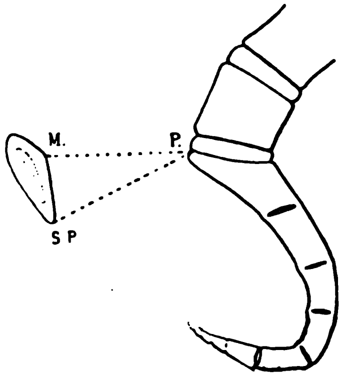
Rickety pelvis, medium inclination of symphysis, angle at *m* 95°, medium height of promontory. (Tarnier and Budin, l. c.) *Pm*, minimum conjugate; *PSp*, diagonal conjugate; *Pm Sp*, promontorio-pubic triangle.

Fig. 343.



Rickety pelvis. Promontory high up, symphysis little inclined. (Tarnier and Budin, l. c.) Letters as in Fig. 342.

Fig. 344.



Rickety pelvis. Promontory very low, symphysis strongly inclined. Letters as in Fig. 342.

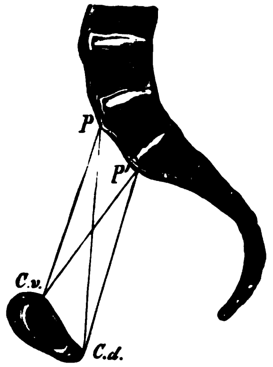
Many instruments have been invented in the hope of determining more exactly the internal measurements of the pelvis, but they are difficult to use, unreliable, or painful. Practical obstetricians have therefore very generally come to the conclusion that manual internal pelvimetry is to be preferred.

If sufficient information cannot be obtained by using one or two fingers, it may be necessary to introduce half the hand (that is, the four fingers) or the whole hand. Since this is very painful, the patient must be anæsthetized.

The transverse diameter is of less importance than the anteroposterior, but if the latter is shortened a concomitant reduction of the transverse diameter increases the difficulties materially. By introducing the hand, spreading the fingers, and moving them from side to side, some idea may be formed of its length.

In regard to the outlet, the transverse measurement may be taken more accurately by applying the first and second fingers against the inside of the tuberosities of the ischia and inserting the fingers of the other hand as a wedge to keep them in place while they are being withdrawn and the distance from one to the other, outer measure, is taken. The anteroposterior diameter of the outlet is easy to take by placing the second finger on the articulation between the movable coccyx and the sacrum and marking the distance to the subpubic arch as in measuring the diagonal conjugate of the brim.

FIG. 345.



Double promontory. (Fürst.) *P*, promontory; *P'*, false promontory, between first and second sacral vertebræ; *P C.v.*, true conjugate; *P C.d.*, diagonal conjugate; *P' C.v.* and *P' C.d.*, the corresponding lines from the false promontory, are shorter, and are those to be considered as indicating the degree of narrowness.

It may be necessary to compare the two sides of the brim, in order to find out if there is any asymmetry in their shape and how much space there is. For this purpose the two hands should be used alternately, the homonymous hand being used for each side—the right hand for the right side of the pelvis, the left hand for the left side. Otherwise that side towards which the pulp of the fingers is naturally turned will appear larger.

In measuring the diagonal conjugate the accoucheur may be deceived by a so-called *double promontory* (Fig. 345). The line of union between the first and the second sacral vertebra, or that between the fourth and the fifth lumbar vertebra, may be so prominent that the distance from it to the symphysis has the same length as or is even shorter than that between the true promontory and the symphysis. The adventitious prominence forms, indeed, a *false promontory*. The true promontory can, however, be recognized in such cases by carrying the examining fingers out to the side and satisfying one's self that the alæ of the sacrum are situated on a level slightly below it.

In a primipara the lack of engagement of the presenting part must awaken the suspicion of a narrow pelvis, while in pluriparæ the fœtus, as a rule, does not engage in the pelvic cavity before labor begins.

Another source of information as to the narrowness of the pelvis is found in the presentation and attitude of the fœtus during labor. Abnormal presentations, such as cross, pelvic, or face presentations, and the prolapse of the cord or of extremities at the side of the head, are much more common in narrow pelves than in normal, especially in primiparæ. Retroflexion of the gravid uterus is also more apt to be found in a pelvis where an abnormally protruding promontory holds the enlarged uterus imprisoned in the cavity than in a normal pelvis. Premature rupture of the membranes and slow dilatation of the os are also very common with narrow pelves.

The mechanism of labor may be characteristic. Thus, in a generally contracted pelvis the small fontanelle sinks unusually deep down, while in a flat pelvis, on the contrary, the large fontanelle is apt to sink down to a lower level than the small.

The shape of the head, the presence on it of wounds due to pressure against the pelvic bones, or indentations of the cranial bones, may not only bear witness to the existence of a narrow pelvis, but allow us indirectly to take an exact measure of the narrowest passage by measuring the distance between two opposed marks. This last class of information is only obtained after termination of the labor, but it is of great value for later pregnancies of the same patient.

To resume, the diagnosis of a narrow pelvis is based upon the history of the case, the appearance of the woman, the physical examination of her pelvis, peculiarities in the mechanism of labor, the configuration of the child's head, and marks on it.

Classification.—There is a great variety of deformed pelves, which are classified in many different ways by authors on obstetrics. This being an entirely practical work, I think it is in the interest of the reader first of all to distinguish common forms, which everybody may meet with who is engaged in obstetric practice, and then the rarer forms, which he perhaps never will see, which are found as curiosities in museums, or which are almost limited to some particular locality. Next, I shall, as has been my aim throughout the work, go from the simple and easy to the more complicated and difficult. I shall be guided chiefly by palpable deviations of form, and secondarily by etiological considerations.

Following these principles, deformed pelves may be classified in the following way:

A. *Common Deformities.*

I. Generally equally contracted pelvis.

Subdivisions:

1. Well-shaped, generally contracted.
2. Male type.
3. Infantile.
4. Rhachitic, generally contracted.

II. Flat pelvis.

Subdivisions:

1. Simple flat pelvis.
2. Rhachitic flat pelvis.
3. Generally contracted flat pelvis.
4. Pelvis flattened by dislocation of both femora.

B. *Rarer Deformities.*

I. Asymmetric pelvis.

Subdivisions:

1. Scoliotic asymmetric pelvis.
2. Obliquely contracted pelvis (*Naegele pelvis*).
3. Coxalgic pelvis.

II. Transversely contracted pelvis.

Subdivisions:

1. Ankylosed, transversely contracted pelvis (*Robert pelvis*).
2. Kyphotic pelvis.
3. Funnel-shaped pelvis.

III. Incurved pelvis.

Subdivisions:

1. Osteomalacic pelvis.
2. Pseudo-osteomalacic rhachitic pelvis.

IV. Spondylolisthetic pelvis.

V. Pelvis contracted by tumors springing from the pelvic bones.

VI. Split pelvis.

Subdivisions:

1. Split at the site of the symphysis pubis.
2. Split at the site of the sacrum.

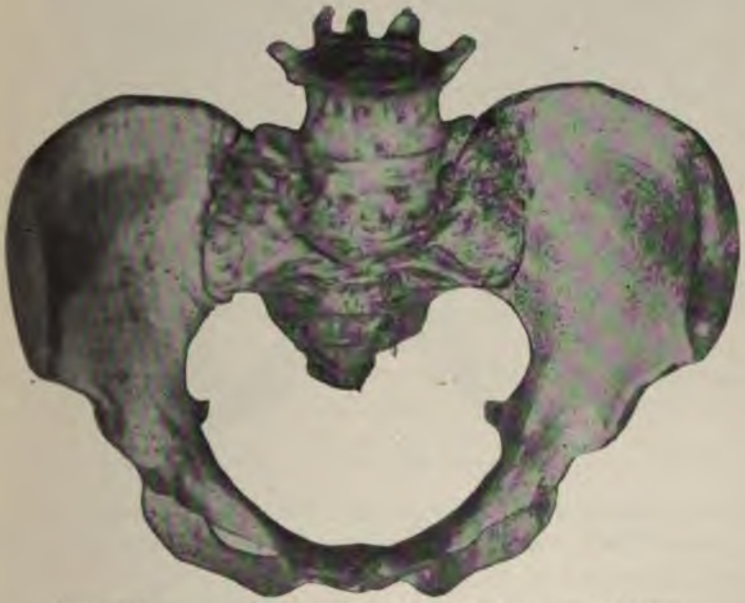
A. *Common Deformities.*

§ 1. **Generally Equally Contracted Pelvis, or Justo Minor Pelvis.**—I place the generally equally contracted pelvis at the head of the list partly because it is the form that comes nearest to the normal forms of pelvis with which we are familiar in the infant and in the adult woman, and partly because it is the form most commonly met with in New York and, it would seem, other Eastern cities.

When we call it the generally equally contracted pelvis this xpression must not be taken too literally. Sometimes the general ontraction is only, or at least chiefly, found at the brim, and the nteroposterior diameter may be a little more contracted than the ther diameters. On account of the diminution in the diameters of e pelvis, even if it is not very great, taking place in all directions, this rm may oppose considerable resistance to the passage of the fœtus.

An equally contracted pelvis may be entirely normal, except that is too small. In most cases the bones are slender and light. Such *ell-shaped* but too small pelves may be found in women who otherise are well proportioned. It may be found also in women of small tature.

Fig. 346.



Generally contracted pelvis, male type, seen from above. (Author's case.)

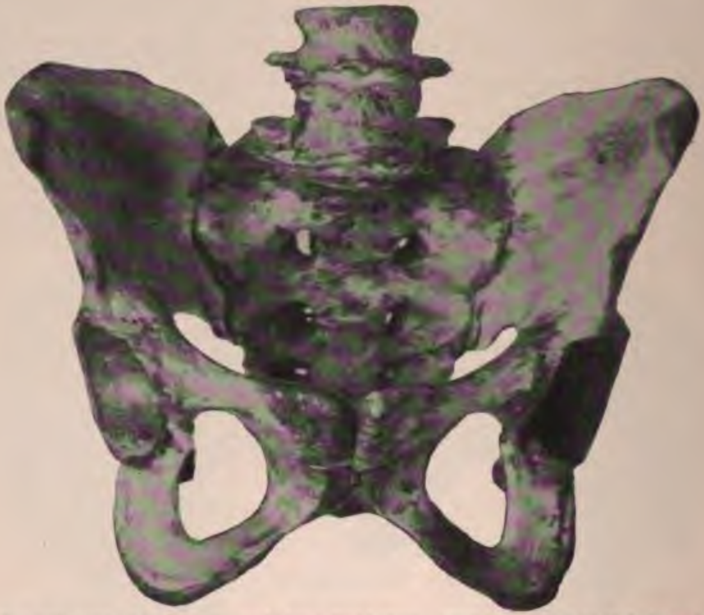
The smallness of this pelvis culminates in dwarfs—the dwarf elvis, or *pelvis nana*. The dwarf pelvis has the shape of that of a irl at puberty, and the ossification is deficient. It is characteristic r the higher degrees of generally equally contracted pelves that the hole linea terminalis may be felt with one finger.

In other cases the pelvis approaches the *male type* of pelvis (Figs. 46, 347). The brim is more round, the ilia rise more perpendicurly, the pubic arch is narrow, and the bones are thick and heavy.

In other cases, again, the pelvis has preserved features of the *infantile pelvis* (Fig. 348). The innominate bone is more perpendicular and may be divided in its three component parts. The pelvic brim is more round, or even forms an oval lying in the anteroposterior direction. The sacrum is narrow and more straight. The symphysis is less inclined than normal.

A particular variety of infantile pelvis is found in women who have spent their whole childhood in a recumbent position—the *pelvis of reclination*. The preponderance of the conjugate over the transverse diameter is well marked, the innominate bones are nearly perpendicular, and the pubic arch is wide (Fig. 349).

FIG. 347.



Generally contracted pelvis, male type, front view. (Same specimen as in Fig. 346.)

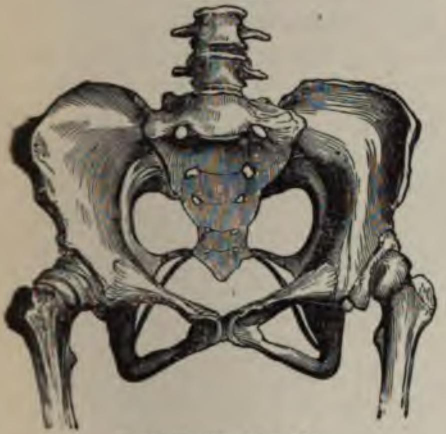
An equally contracted pelvis of the infantile type is found in idiots and other weak-minded women, combined with defective development of the external and internal genitals.

The equally contracted pelvis may be of *rhachitic* origin, which shows in the characteristic proportion between the length of the distance between the anterior superior spines of the ilia and that between the crests. This is a rare variety.

The generally equally contracted pelvis being so near the normal, the *mechanism of labor* is also much the same; but a characteristic sign is the lower position of the posterior fontanelle. Room being scant, the normal flexion of the neck is exaggerated so as to allow the head to descend with its smallest circumference,—the suboccipitobregmatic,—which measures only eleven inches (twenty-eight centimetres). Thus the posterior fontanelle is brought down and nearer the centre of the pelvis than in pelves of normal shape. Labor progresses slowly and uterine contractions are liable to become weak.

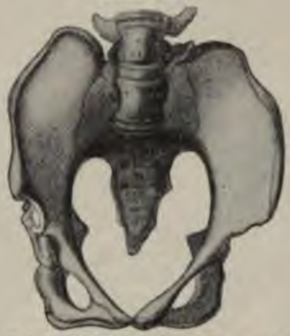
The shape of the head after delivery through a generally contracted pelvis is also characteristic. It is compressed in its suboccipitobregmatic circumference and bulges out in the direction of the posterior fontanelle. In other words, it is pointed, with an increase of the occipitomental diameter.

FIG. 348.



Infantile type of pelvis.

FIG. 349.



Pelvis of reclination. (Büttner.)

Besides this elongation of the head there is sometimes found a lateral flexion or torsion produced by the occiput tending to get under the pubic arch while the anterior temple is still retained at the brim and pressed against the anterior wall of the pelvis.

The equally contracted pelvis is not so likely to produce pressure marks on the head of the fœtus as other forms of contracted pelvis.

Diagnosis.—The size of the pelvis and the low place of the posterior fontanelle make the diagnosis clear.

Prognosis.—No child can pass through a dwarf pelvis; the only means of relief is to be found in the Cæsarean section. In medium degrees of contraction the child may be born by nature's sole effort or by the intervention of art. There is usually such a difficulty in pulling the aftercoming head through that the child is likely to die if version is performed. The resistance not being confined to one ring, but going through the whole passage, and even increasing as the head is pulled deeper into the cavity, forceps operations are difficult, and often lead to the death of the fœtus, when the forceps has to be abandoned for the perforator. The mother may die from exhaustion or infection.

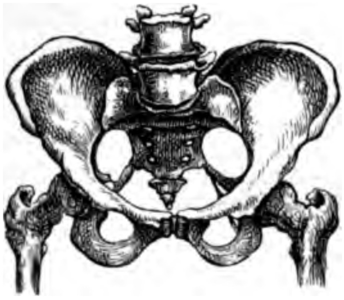
Treatment.—Impressed by the great infantile mortality and the frequent loss of the mother when delivery was sought to be effected per vias naturales, years ago the author entered on the record-book of Maternity Hospital his opinion that Cæsarean section gave both mother and fœtus much better chances. That was before the revival of symphyseotomy. Now I take this to be the operation indicated as soon as moderate traction with the forceps proves ineffective.

§ 2. **Flat Pelvis.**—A flat pelvis is one whose true conjugate is shorter than normal. The pelvis has consequently an abnormal shape. The transverse diameter of the brim may be of normal length or even longer. The flatness may be limited to the superior strait or may extend through the whole pelvis.

Flat pelves may be divided into three groups,—the simple flat pelvis, the rhachitic flat pelvis, and the generally contracted flat pelvis.

1. SIMPLE FLAT PELVIS.—The simple flat pelvis (Fig. 350) is a flat pelvis in an individual who has no history of having been affected with rhachitis in childhood and who does not show any signs of that disease either in the pelvis or in any other part of the skeleton.

FIG. 350.



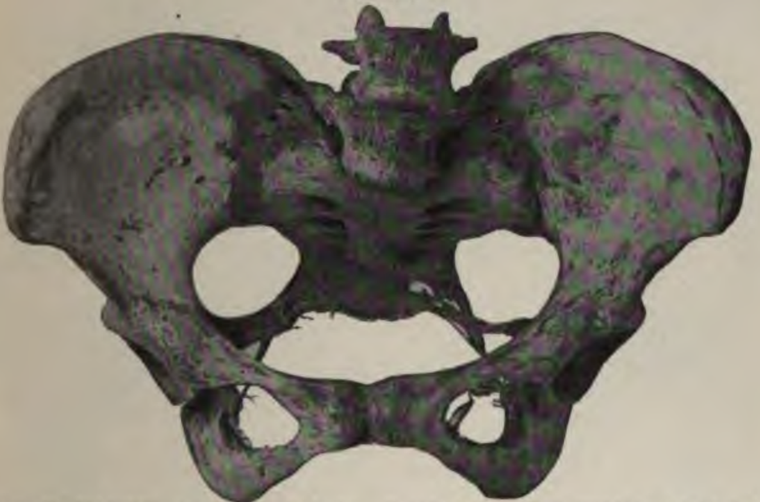
Simple flat pelvis. (Olshausen-Veit.)

In this variety the bones of the pelvis are of normal thickness, but small, especially the sacrum. The narrowness frequently extends throughout the pelvis, even if it is most marked at the brim. The outlet is not enlarged. The transverse diameters are normal or at least not materially elongated. This is the most common form of all flat pelves. The narrowness is moderate and hardly ever goes below a true conjugate of 3¼ inches (8 centimetres). But on account of the extension of the narrowness in the diagonal diameter downward and the lack of compensating gain in the transverse diameters, this form may oppose a considerable obstacle to the passage of the fœtus.

The origin of this form of pelvis is not positively known. Perhaps it is only due to an exaggeration of the normal process by which the pelvis of the new-born is changed to that of the adult. The sacrum sinks forward and downward into the pelvic cavity, but does not rotate around its transverse axis. Thus the anteroposterior diameters are shortened. The sacrum being bound to the ilium by the strong iliosacral ligaments, these are put on the stretch, which would tend to open the pelvis in front. This being prevented by the symphysis pubis and the strong ligaments surrounding it, the result would be an increase in the transverse diameters, and when this is not found, we must attribute it to some degree of narrowness in the original construction of the pelvis.

When one looks at the hard, thick bones of the pelvis of an adult, it is difficult to realize such transmutations of shape, but we must remember that during childhood a large portion of the pelvic bones is still cartilaginous and pliable (Fig. 180, p. 145), and even in youth the sacral vertebræ are still united by cartilage. The union between the three bony nuclei found in each sacral vertebra takes place from the second to the sixth year. On the body of each vertebra epiphyseal plates are formed after puberty, as in other vertebræ, and two flat, irregular plates of bone are added to each lateral surface of the sacrum, the uppermost of which extends over the auricular surface and the lower over the sharp edge below. These appear about the eighteenth year, and are united about the twenty-fifth. The bodies of the sacral vertebræ are first united by intervertebral disks. Osseous union begins from below and extends upward. This process commences in the eighteenth year and is not always finished by the twenty-fifth. The ilium, ischium, and pubis do not grow together before the seventeenth or eighteenth year.

Fig. 351.



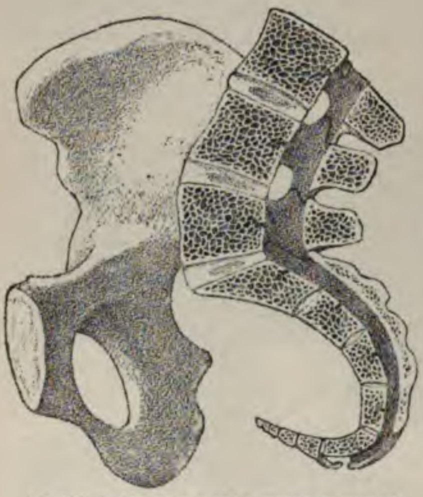
Rhachitic flat pelvis. One-third natural size. (Wood's Museum, Bellevue Hospital, No. 181.)

Others think that the formation of the simple flat pelvis is due to the mildest degree of rhachitis, a degree so mild that it did not leave any other trace in the pelvis and the rest of the skeleton than this flatness.

2. Rhachitic Flat Pelvis.—In the rhachitic flat pelvis (Fig. 351) the bones commonly are thin and slender, but may be even unusually thick and coarse. They are small, especially the ilium. The ilium

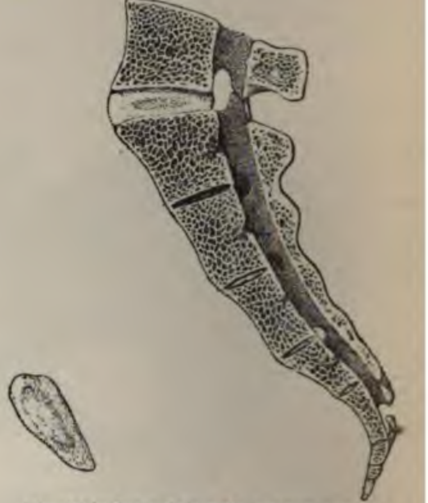
lies more horizontally. It is flat, its crest less curved, its anterior superior spines stand far out, so that the distance between them sometimes is as long as or longer than that between the crests. The sacrum is small. Its transverse curvature is nearly lost. Its perpendicular curvature varies much. In most cases the bone is more or less strongly curved, even so as to project forward like a hook (Fig. 352). In others, on the contrary, it is nearly straight, or even convex (Fig. 353). The bodies of its vertebræ are strongly compressed from above downward behind the alæ. The whole bone is driven forward and downward, and the bodies of the vertebræ have sunk down between the alæ. At the same time it has rotated around its transverse axis, so as to approach the promontory to the symphysis. On the other hand, the symphysis moves backward and upward in the direction of the promontory. When this is well marked the brim of the pelvis approaches the shape of a lying figure of eight—∞. The tuberosities of the ischium are turned outward and wide apart. The pubic arch is large. The acetabulum is turned more forward than normal. The whole pelvis in most cases is low, the cavity wide, but the sacrocotyloid distance diminished. The transverse diameters are not shortened and are often elongated. The inclination of the pelvis is considerable, and the angle formed by the minimum diameter of the brim and the posterior surface of the symphysis large. In computing the true diagonal much must therefore be subtracted from the diagonal conjugate. Fig. 354 shows a rhachitic pelvis with heart-shaped brim.

FIG. 352.



Rhachitic flat pelvis with strongly curved sacrum. (Tarnier and Budin, l. c.)

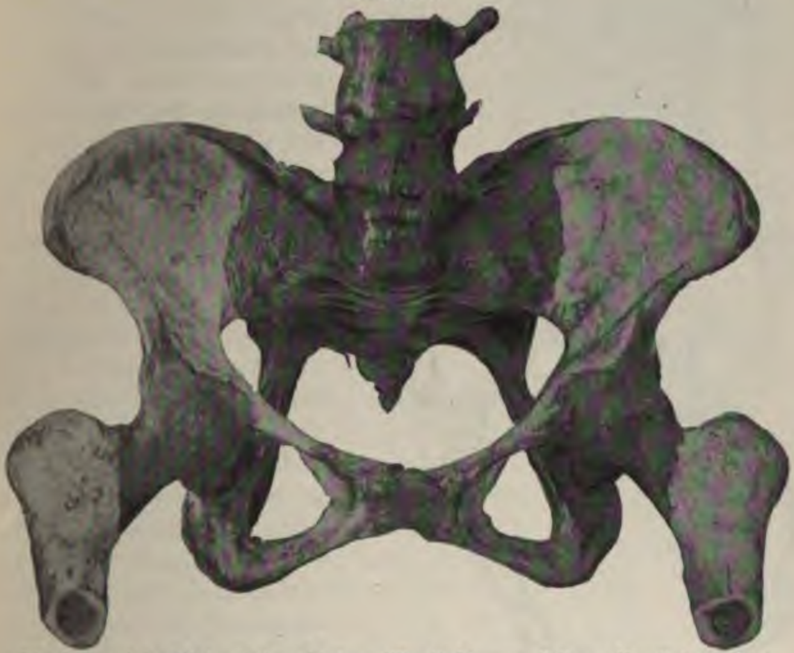
FIG. 353.



Rhachitic flat pelvis with convex sacrum. (Tarnier and Budin, l. c.)

Rickets is a constitutional disease of childhood characterized by a disorder of nutrition of the bones. The osteoid layer between the already formed bony structure and the cartilage which precedes the bone becomes inflamed. The calcareous matter in the bones is absorbed and the tissue is full of inflammatory corpuscles,—small, round cells. The bones become soft and pliable, and bend under the influence of weight, ligamentary tension, muscular contraction, and the growth of internal organs; and certain characteristic changes remain permanently in the skeleton after the disease has run its course and consolidation has taken place, as shown in a pronounced degree in Fig. 355.

FIG. 354.

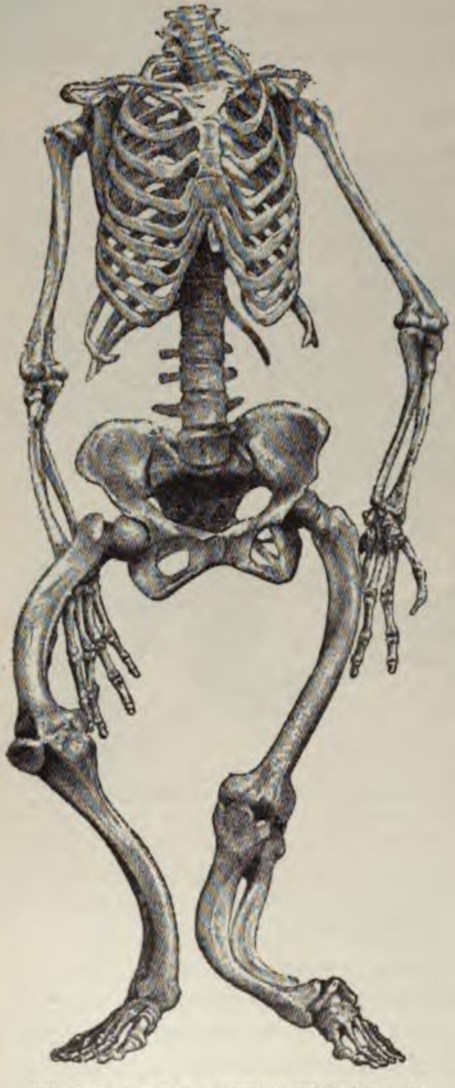


Rhachitic pelvis with heart-shaped brim. (Wood's Museum, Bellevue Hospital, No. 170.) One-third actual size.

The legs become curved, the pelvis is changed as described above, the vertebral column is deviated, the lower ribs bulge out while the upper are flattened; the breast-bone protrudes, forming the so-called *chicken-breast;* the anterior ends of the ribs are swollen, presenting a line of nodules known as the *rhachitic rosary;* the skull is large and quadrangular, contrasting with the small triangular face. On the upper extremities the thick wrists are the most prominent feature.

Rhachitis may be congenital, but most frequently makes its appearance between the fourth and the seventh month of extra-uterine life, at a period when the child has not yet begun to walk, or, if the disease breaks out later, the child stops walking and remains lying and sitting up in bed. The peculiarities of the rhachitic pelvis are all referable to the softening of the bones, pressure, and lack of use of the lower extremities. There being no lateral pressure from the femora, the pelvic form is decided by the weight of the upper half of the body pressing the posterior wall from above and behind in the direction of the anterior. The tension upon the ligaments behind and in front draws the pelvic ring out to the sides, making the iliac bones gape and turning the acetabula forward. When later the child begins to walk, the pressure of the femora will only increase the flatness of the pelvis. The middle part of the sacrum is pressed in between the lateral parts, bringing the promontory forward and downward, while the sacrosciatic ligaments pull the lower part of the bone forward, which results in the common strong perpendicular curvature of the bone. In rarer cases the pressure takes such a direction that it straightens the bone out in its upper part, but the lowest nearly always is turned forward. The tuberosities are spread apart and the arch flattened chiefly by pressure against the couch, and secondarily by the pull of the muscles attached to their outer surface.

FIG. 355.



Rhachitic skeleton. (Tarnier and Budin, l. c.)

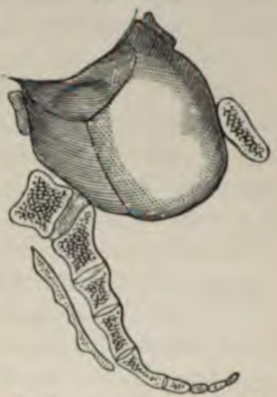
Besides these mechanical agencies there must be an unknown force at work in the rudimentary beginnings of the pelvis, as evinced by the shape found in congenital rhachitis.

Rhachitis gives rise to the highest degrees of flat pelvis, producing pelves that have a true conjugate of three and one-quarter inches or less.

Mechanism of Labor in Flat Pelvis.—Abnormal presentations are much more common with a flat pelvis, be it rhachitic or not, than with a normal pelvis. They are even not infrequent in primiparæ, who rarely have them when their pelves are normal. The vertex does not engage easily and slides to one side, which leads to transverse or pelvic presentation; or, the occiput hitching against the rim of the pelvis, a face or brow presentation may be developed. In pelvic presentations the broad buttocks are not easily engaged and let the smaller feet sink down ahead. With presenting head there is a tendency to prolapse of a hand, an arm, a leg, or the cord beside the head. In transverse presentations the dorsoposterior position is much more frequent than in a normal pelvis.

In *vertex presentation* the mechanism is quite different from the one we have seen in the generally contracted pelvis. The head stands transversely over the brim. The occiput slides to one side, and the anterior part of the vertex with the large fontanelle sinks down. The head passes the available diameter of the brim with a part lying a little in front of the parietal eminences or even with the bitemporal diameter. At the same time the head becomes laterally inclined so that the anterior bregmatic bone nearly occupies the whole brim and the sagittal suture runs transversely near the promontory (Fig. 356). The anterior temple is pressed against the symphysis, which forms a fulcrum around which the head rotates, the anterior parietal bone being more and more bent, while the posterior is flattened against the promontory and gradually is pushed down into the pelvic cavity. When the head has passed the narrow brim, the occiput generally sinks down and turns forward as in a normal pelvis.

FIG. 356.



Engagement of vertex in flat pelvis. (Olshausen-Veit.)

Exceptionally, it is the posterior parietal bone that occupies the brim, the sagittal suture runs transversely behind or above the symphysis pubis, and the posterior temple is pressed against the promontory. We have seen above that a similar lateral obliquity of the head may be found with a normal pelvis (p. 366: anterior and posterior parietal presentations and ear presentation). This posterior parietal presentation is very unfortunate, since the engagement of the head becomes exceedingly difficult or impossible on account of the direction of the uterus forward. The neck of the child becomes strongly bent laterally against the anterior shoulder. The only way in which the head can pass is that the posterior temple is pushed down under the promontory, and that subsequently the anterior parietal bone descends behind the anterior wall of the pelvis.

As a rule, the fœtus dies during the tedious labor, and even the mother is in great danger on account of the distention of the posterior part of the lower uterine segment.

The *shape of the head* of the child caused by the passage through a flat pelvis is characteristic. The occipitofrontal diameter becomes elongated and the transverse diameters become shortened. The serosanguinolent swelling constituting the caput succedaneum is generally found on the anterior part of the vertex, especially if the latter part of labor has been so rapid that no swelling has formed on the occiput. Pressure marks are mostly found on the parietal bone, and are particularly produced by the promontory. They take the shape of round or oval spots or a stripe running parallel with and behind the coronal suture from the large fontanelle to the temple, or forming an angle opening forward (Fig. 360). We shall reserve details about the moulding of the head and pressure marks for further consideration.

In rare cases the head is observed to go down in another way than the one described as characteristic for labor with flat pelvis,—namely, so that only one side of the pelvic brim is used for the passage of the head. This *extramedian engagement* is most likely to occur in pelves of the figure-of-eight shape, in which the promontory is very prominent and the symphysis pubis projects inward into the pelvic cavity. Then the head passes as in the generally equally contracted pelvis, with the small fontanelle low down. When the brim is passed, the position of the head becomes normal.

Face presentation is, as we have said, more frequently encountered than in normal pelves. The course of labor is very slow, the face continuing to stand transversely, the chin at one end and the forehead at the other end of the transverse diameter. It takes long before the chin rotates forward, and the prognosis for the child is even worse than with vertex presentation.

The *pelvic presentation*, on the other hand, is somewhat more favorable for the child, since the aftercoming head engages with less difficulty than the presenting vertex. Still the process is so slow that without the intervention of art the fœtus generally dies, and it even often does so when its head is being pulled through artificially.

Transverse presentations usually end as shoulder presentations.

Labor is still more difficult than in a normal pelvis with this presentation, and ought never to be left to nature.

The *diagnosis* of a simple flat pelvis is based on the results of pelvimetry and the low position of the large fontanelle. The flat rhachitic pelvis is recognized by the same features combined with those peculiar to rhachitis. The history may give a hint. If the patient did not begin to walk before she was two years old, it is likely she was suffering from rickets. Next, the degree of contraction is of diagnostic importance. The higher degrees of narrowness—a true conjugate of 3¼ inches (8 centimetres) or less—are found only with rhachitis. Finally, the characteristic shape of the rhachitic pelvis, the comparatively long distance between the anterior superior spines of the ilium, the flatness of the iliac bones, and signs of rhachitis in other parts of the body—the thick wrists, the prominent breast-bone, the flattened ribs, and the short, curved lower extremities—remove every doubt in regard to the origin of the disease.

Difficult labor is much more common in pluriparæ with narrow pelves than in primiparæ, which is attributable to a weakness in the uterine wall left by previous labors. This favors abnormal presentations and attitudes of the child, and causes weak contraction of the muscle-fibres. Pendulous abdomen, which leads to an unfavorable presentation, is also much more common in pluriparæ. And, on the other hand, the fetal head becomes larger in successive pregnancies.

Course of Labor in Flat Pelvis.—Labor is apt to be very slow, even protracted over several days, which tediousness is not all due directly to the mechanical disproportion between the head of the fœtus and the mother's pelvis. Other factors—slow dilatation of the os and weakness of the uterine contractions—contribute to this result.

The slow dilatation is itself due partly to this weakness of uterine contractions, and partly to the common occurrence of premature rupture of the membranes, a fact that may find its explanation in the less perfect adaptation between the presenting part and the pelvic brim, which allows a greater amount of liquor amnii to accumulate below the fœtus. By the premature rupture of the membranes the normal elastic pressure of the bag of waters against the cervix during the opening stage is lost, and the cervical muscular tissue becomes irritated by compression between the head and the pelvis.

When the waters have broken and the os is still small, uterine contraction may push the fœtus into the lower uterine segment and the cervix, which become much distended and so thin that they may give way. The contraction ring is drawn high up and may be seen at the level of the umbilicus.

The undilated cervix in other cases becomes œdematous, and, as we have seen above, the anterior lip is especially exposed to being caught between the advancing head and the symphysis pubis.

Uterine contractions may be primarily weak and often become so secondarily, the nerve force being exhausted by the abnormal amount of work the uterus is called upon to perform in order to overcome the obstacle that obstructs the passage.

In other cases the uterus becomes permanently contracted around the fœtus,—*tetanus uteri*,—which opposes an almost insuperable resistance to obstetrical operations.

The mechanical disproportion may be so great that the presenting part, particularly the head, does not engage at all; but in the majority of cases the head, through a slow process of moulding, adapts itself to the pelvis. This work is done exclusively by uterine contraction, while the beginning of abdominal pressure is a signal that the moulding has been perfected and that the head is about to pass the brim of the pelvis. Two other symptoms herald the same event,—namely, a sudden desire to defecate, although the rectum is empty, and a cramp in the calves produced by pressure on the sacral plexus.

During this process of moulding there is often formed on the presenting part of the head a caput succedaneum, which may mislead the accoucheur, inducing him to take the serosanguineous swelling which bulges out on the head for the bony head itself, and to think that this has descended while in reality it is still above the brim.

When the head has passed the brim, labor becomes easy in those cases of flat pelvis in which the narrowness is limited to that part of the pelvis.

§ 3. **Generally Contracted Flat Pelvis.**—The generally contracted flat pelvis combines the characteristics of the generally contracted and the flat pelvis. It is a flat pelvis in which the transverse diameter is shortened beside the anteroposterior diameter.

This form of pelvis is nearly always of rhachitic origin.

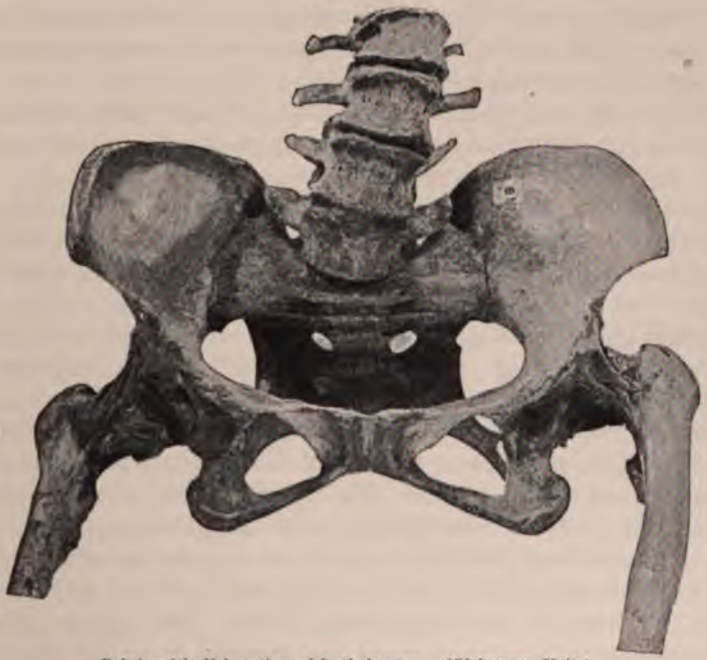
The *diagnosis* may be difficult and is mostly based on the way in which the fœtus passes, which is a combination of the mechanism in generally contracted and flat pelves. In most cases the head stands transversely as in the flat pelvis, and the small fontanelle stands low; but often the anterior part of the vertex and the occiput alternate in their descent, so that at times the small fontanelle and at others the large occupy the lowest position in the pelvis. In this form of pelvis the extramedian engagement of the head—the forehead remaining high in the iliac fossa while the occiput descends through one-half of the pelvis—is also frequent.

§ 4. **Pelvis Flattened by Dislocation of both Femora.**—Before leaving the flat pelvis we must mention a peculiar form due to the congenital dislocation of both femora (Fig. 357).

This pelvis is characterized by flatness, a great inclination, and considerable increase in the length of the transverse diameter throughout the pelvis. The sacrum has sunk deep in between the hip-bones. The ilium is steep. The pubic arch is very open and the tuberosities of the ischia are turned outward. The transverse diameter of the outlet is much enlarged, while the anteroposterior is shortened.

The head of the femur resting on the outer surface of the ilium pushes it up into the more perpendicular position. The deep position of the sacrum increases the transverse dimensions and diminishes the conjugate, and there is no counter-pressure against the acetabula to counterbalance this influence. At the outlet the protracted sitting posture, necessitated by the inability to walk in early childhood, contributes to the large span of the arch and the great distance between the tuberosities.

FIG. 357.



Pelvis with dislocation of both femora. (Olshausen-Veit.)

The great inclination of the pelvis is due partly to the pull on the strong iliofemoral ligament and the psoas and iliacus internus muscles, partly to the removal backward of the points of support. The heads of the femora being pushed backward, the upper portion of the body would fall forward if the lumbar portion of the vertebral column were not curved forward, carrying the upper portion of the body backward, and this lordosis again increases the inclination of the pelvis.

In regard to mechanism of labor, prognosis, and treatment, this pelvis is much like the flat rhachitic pelvis.

§ 5. **Dangers for the Mother in Cases of Contracted Pelvis.**—Any form of contracted pelvis exposes the mother to more or less danger, and the greater the contraction is the more the peril increases. The soft parts suffer through the pressure to which they are exposed. In this respect vertex presentations are the worst, the head being harder than the breech. The soft parts stand a severe pressure a short time much better than a more moderate pressure that extends over a longer period. The protracted pressure of the vertex therefore does more harm than the rapid passage of the after-coming head when it is pulled through by the obstetrician.

The pressure against the promontory is particularly harmful. In easier cases it may cause only a local inflammation, but in severer ones it may result in gangrene of the uterus. Before complete mortification sets in, the part is, however, surrounded by adhesive inflammation, which encapsulates the dead tissue and prevents the peritoneal cavity from being opened, but may lead to permanent adhesion of the uterus.

In front the bladder, situated between the cervix and the symphysis, is exposed to pressure, which often results in the formation of a urinary fistula.

The disproportion between the head and the pelvis may cause the rupture of one or more of the articulations of the pelvis, most frequently the symphysis pubis. The rupture of the symphysis is characterized by local pain, diastasis between the ends of the pubic bones, and rotation outward and lameness of the lower extremities.

The protracted labor, the frequent examinations, and necessary operations increase the danger of infection. Gas may be produced by microbes in the uterine cavity and distend it so that the fundus reaches the diaphragm, a condition called *physometra* or *tympania uteri*. Percussion gives then a tympanitic sound. Offensive gases may escape during examinations or after the expulsion of the fœtus. Frequently the patient becomes feverish.

Independently of the danger of infection, the patient's strength is liable to give out. She is worn out by pain and physical exertion.

The pressure on the soft parts is apt to cause inflammation. If there are strong uterine contractions and the resistance is insuperable, the lower uterine segment and the cervix may rupture.

The pressure on the sacral plexus may lead to paralysis, contracture, or protracted neuralgia in the lower extremities.

The operations performed in order to deliver the patient may become dangerous to her. Thus version, when the lower uterine segment and the cervix are much distended, may directly lead to the rupture of these parts of the uterus.

The forceps may do great harm, not only if it is applied outside of the cervix, which it crushes and tears, but even if it is applied through an insufficiently dilated cervix. The accommodation of the head to the pelvis obtained by hauling on it with the forceps cannot be compared with that accomplished by nature by means of uterine contractions, and the maternal tissues are therefore exposed to most injurious pressure. Symphyseotomy and Cæsarean section contain dangers of their own which we shall describe later.

Pelvic presentation is more favorable to the mother than vertex presentation. The breech presses less than the head, and, as a rule, this latter will be helped out with or without perforation.

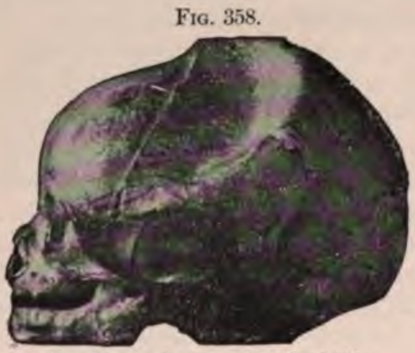
Transverse presentations are very serious if they are neglected, but if they are discovered in time and treated intelligently, they are not much worse for the mother than in normal pelves.

§ 6. **Dangers for the Fœtus in Contracted Pelvis.**—If labor with a contracted pelvis is fraught with dangers to the mother, it is still more so in regard to the fœtus.

The strong uterine contractions that are necessary to overcome the obstacle placed in its way in a narrow pelvis may in different ways hurt the fœtus. The blood is pressed out of the uterus and into the maternal vessels, so that there is less to carry oxygen to the placenta. This organ may be prematurely detached, which directly induces asphyxia of the fœtus. The same results from compression of the umbilical cord, which is common in narrow pelves. The strong compression to which the skull is exposed may cause irritation of the pneumogastric nerve, which renders the heart-beat slow. It also plays a chief *rôle* in the changes observed in the shape of the head. We have already mentioned the caput succedaneum which forms on the part that is least exposed to pressure, but it does so only by the compression of the surrounding portions of the head. In equally generally contracted pelvis, in most cases of flat generally contracted pelvis, and in cases of extramedian engagement the caput forms as in labor in a normal pelvis around the small fontanelle. In the flat pelvis it develops, on the contrary, in the region of the anterior fontanelle. It is innocuous in itself and disappears a few days after delivery. It may even be useful to the mother by replacing the missing bag of waters and helping to dilate the cervix, but it may give the accoucheur the erroneous idea that the head has descended when in reality it is still detained at the brim. It can, however, easily be distinguished from the skull by the softness of its structure, especially in the interval between uterine contractions.

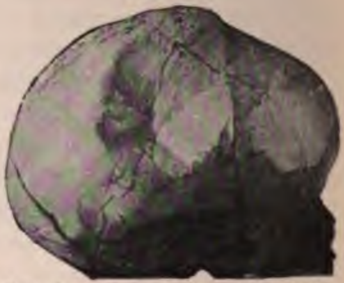
The bones of the skull are pushed over and under one another and are bent, transpositions and deformations which, if they are moderate, need not have any bad effect, and which disappear in a few days after the birth of the child. Apart from all moulding, in labor with normal pelvis, and even on the head of the children brought to the world by Cæsarean section, there is a *physiological congenital asymmetry of the head.* It is a kind of scoliosis of the vertebræ, of which the skull is composed originally. The right temple and the corresponding portion of the base of the skull are more prominent than on the left side, while on the occiput is found a prominence somewhere to the left of the median line and a lesser prominence or even a flattening to the right. It is also well known that there is considerable difference between the two sides of the head in adults.

Fig. 358.



Deep depressions on presenting head.
(Olshausen-Veit.)

Fig. 359.



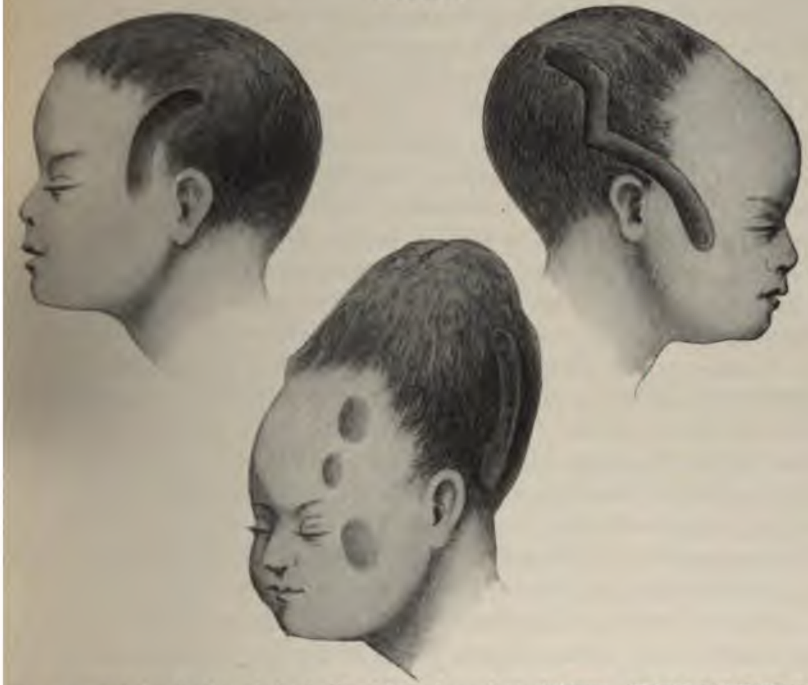
Deep depressions on after-coming head.
(Olshausen-Veit.)

If the limits of adaptability of sutures and bones are passed, the head sustains injuries which even may be fatal. Sutures may be torn and the underlying sinuses wounded, especially the superior longitudinal sinus when the parietal bones are displaced, and the transverse sinus when the temporal bone is torn loose from the parietal, which is most apt to happen when the after-coming head is dragged through a narrow pelvis. The condylar portions of the occipital bone are sometimes torn from the tabular portion.

The bones themselves may be broken. So-called *fissures* form in the direction of the osseous fibres. They may be distinguished from gaps due to insufficient ossification by their bloody edges. In the tabular portion of the occipital bone such a transverse fracture is often found corresponding to the line of union between the pieces of bone that are formed from different points of ossification.

Another form of fracture is found in the so-called *depressions* (Figs. 358, 359). These depressions are found on the parietal and frontal bones, and may be produced by mere uterine contractions, but often they are due to the use of the obstetric forceps. Half of the children die during or shortly after birth. In those who survive the depressions may be obliterated, but often they remain through life. Sometimes they cause idiocy or other disturbances of the nervous system, but in other cases the children recover entirely and do not show any ill effect of the injury sustained during labor.

FIG. 360.



Pressure marks on the skin of the skull and face of new-born children. (Fritsch and Küstner.)

By these tears and breaks more or less blood is poured out on he surface of the brain. In many instances it is again absorbed, but if it compresses the medulla, or if the loss of blood is large, the fœtus succumbs. When the forehead sinks low down, the orbit may be exposed to such a pressure that its temporal wall is depressed and the eye pushed out—*exophthalmus.*

We find also pressure marks on the soft tissues of the head. They may be mere round or oval spots or long stripes (Fig. 360). They may be only superficial scratches, and then they are pink. Or the pressure may have gone deeper and lasted longer, when they have a purple color. If the pressure has been still more considerable, the whole layer of soft tissue, inclusive of the periosteum, may be mortified. In this case the dead tissue is eliminated and the gap filled by granulation, while the more superficial traces regain their normal color and structure. These pressure marks correspond chiefly to the promontory, but more rarely similar marks may be found on the other side of the head, where they are due to a projecting symphysis. Still less frequently they are left by the spine of the ischium or other projecting thorns and lines. In some pelves the pubic portion of the iliopectineal line is as sharp as a knife, or a bony thorn is found in the attachment of the psoas minor muscle. Such pelves have been described under the name of *thorn-pelves*, but they are found as well in males as in females.

Besides the head, other portions of the fœtus may suffer injury during labor. In the upper part of the sternocleidomastoid muscle is sometimes found a *hæmatoma*. This collection of blood forms a small, hard tumor in the second week after birth. It is usually due to rupture of muscular fibres caused by the manual extraction of the head or by the application of the forceps, but it has also been found after easy normal labor, and is then attributed to intra-uterine disease of the muscle. Applications of arnica and massage further the resolution of the swelling.

Fracture of the humerus is generally due to carelessness in the liberation of the arms in manual extraction. If the accoucheur, instead of following the rule to advance until he reaches the elbow before trying to bring the arm down, places his thumb as a fulcrum on the middle of the humerus and two fingers spread on the other side, he exposes this slender bone in the highest degree to the danger of being fractured. But if there is any difficulty in reaching the elbow or otherwise bringing the arm down, and the child's life is in danger, it is better to extract a live child with a broken arm, that by proper care heals in two weeks, than to let the child die.

Fracture of the collar-bone and the cervical vertebræ occurs also. As a rule, it may, however, be avoided by taking care always to turn the back of the child in the direction in which the occiput is, so as to avoid torsion of the neck.

Of a somewhat similar nature to fractures is the *loosening of the epiphyses* of the long bones, which may also happen.

Paralysis of the upper extremities is mostly due to lesion of the cervical plexus. It arises particularly in consequence of the liberation of the arms in pelvic presentation. Sometimes the injury is limited to the radial or the ulnar nerve. In other cases there is a more complex paralysis of the infraspinatus, the brachialis anticus, and the rotatory muscles, an affection produced by pressure on the sixth cervical nerve and known as *Erb's paralysis.* Such nerve lesions should at an early date be treated with electricity.

§ 7. **Treatment of Labor in Flat and Generally Contracted Flat Pelvis.**—In discussing the treatment to be followed in labor obstructed by a flat pelvis it is convenient to keep in mind the division of the narrowness into three degrees referred to above (p. 436), two of which are again subdivided into two groups.

CLASS I. First degree. True conjugate 3½–4 inches (9–10 centimetres).

CLASS II. Second degree. True conjugate 2¾–3½ inches (7–9 centimetres).

Group a. True conjugate near 3½ inches (9 centimetres).

Group b. True conjugate near 3 inches (7½ centimetres).

CLASS III. Third degree. True conjugate below 2¾ inches (7 centimetres).

Group a. True conjugate 2–2¾ inches (5–7 centimetres).

Group b. True conjugate below 2 inches (5 centimetres).

In the first degree, where the length of the true conjugate is not below 3½ inches (9 centimetres) in a flat pelvis (or 3¾ inches—9½ centimetres—in a generally contracted flat pelvis) the contraction is evinced only by the peculiar position occupied by the head. In this mildest degree of contraction labor may proceed without the interference of art, or if it is necessary to expedite delivery on account of the condition of the mother or the fœtus, as a rule the extraction by forceps is indicated.

No less clear is the line of conduct to be chosen by the accoucheur in the highest, the third, degree of contraction, where the true conjugate is less than 2¾ inches (7 centimetres). If the true conjugate measures below 2 inches (5 centimetres), Cæsarean section should be performed at once, whether the fœtus is dead or alive, for, although the fœtus has been broken up and delivered through a narrower pelvis, the danger to the mother is much greater than in modern Cæsarean section.

If the true conjugate measures between 2 and 2¾ inches (5–7 centimetres), Cæsarean section should only be performed when the fœtus is alive. If it is dead, craniotomy is indicated.

In the intervening second class of narrow pelves, whose true conjugate measures between 2¾ and 3½ inches (7–9 centimetres), a good deal of judgment may be needed, as we have to choose between version, forceps, and symphyseotomy. This class, like the third, may conveniently be subdivided into two groups. 2¾ inches (7 centimetres) is the shortest true conjugate that will allow the passage of a living child, and this is possible only under favorable circumstances—good uterine contractions, a full-sized transverse diameter, and a small head. The first group comprises those pelves whose true conjugate is near 3½ inches (9 centimetres), and the second those whose true conjugate is near 3 inches (7½ centimetres).

If there is a cross presentation or a face or brow presentation, the fœtus should be turned and extracted. But if there is a vertex or breech presentation and a conjugate of 3½ inches (9 centimetres), one may expect that a majority of labors will end favorably and perhaps even without artificial intervention. We should therefore give nature ample scope. We should let the uterine contraction have plenty of time to open up the cervix, but if needed, we may help the dilatation by means of chloral, antipyrin, or Barnes's and Champetier de Ribes's dilators, a colpeurynter, or manual dilatation by Harris's or Bonnaire's method. (See OPERATIONS.) We may further the engagement of the head by direct pressure through the abdominal wall on the occiput and the chin of the fœtus. When the os is fully dilated the membranes should be ruptured, so as to give the uterine contractions a chance to mould the presenting head. If the abdomen is pendulous, the uterus should be raised and kept in proper position by means of a binder. A hypodermic injection of morphine may relieve pain, produce sleep, and give the flagging uterine contractions new strength. If necessary, labor is ended by means of the forceps. In rare cases it may be necessary, in order to gain room for the application of the forceps, to incise the not fully dilated cervix. If the fœtus is dead, the head is first diminished with the perforator.

In case of danger to mother or fœtus demanding prompt delivery, labor is ended by version if the head yet is freely movable over the brim of the pelvis, or by forceps if the head is well engaged. But the forceps seizes the head over the occiput and forehead and by compression will increase the size of the transverse diameters of the head. Too great strength should not be used, for fear of injuring both mother and fœtus. Under such circumstances the man who is limited to his own resources will do better in having recourse to the perforator, whether the fœtus is dead or alive. He who has the necessary assistance, and especially those who operate in hospitals, should substitute symphyseotomy when the fœtus is alive, and reserve the perforator for a dead fœtus.

In pelvic presentations it is advisable early in labor to bring down one of the feet, so as to have something to take hold of and avoid an impaction of the breech with legs extended in front of the fœtus.

When the genital tract has been sufficiently dilated by the breech, the fœtus should be extracted. In helping the head out the accoucheur should pull in the direction in which the head stands in the pelvis, and not try to change its position, which is likely to increase the difficulties of its passage. The back of the child should be held so as to correspond to the occiput, in order to avoid torsion of the vertebral column, which may cause fracture of bones, rupture of ligaments, and compression of the medulla.

We come now to the second group of the second class of pelves, those where the true conjugate is in the neighborhood of three inches (7½ centimetres). If the vertex presents, we have to choose between early version and extraction on one side and expectant treatment followed by the forceps and perhaps symphyseotomy or Cæsarean section on the other. The last-named operation should be chosen only in the beginning of a labor and when it is certain that no infection has taken place. Otherwise the prognosis becomes too serious. It is a clinical experience that women will bear symphyseotomy after examinations have been instituted with proper precautions and an attempt made to deliver with forceps. Not so with Cæsarean section, in regard to which it makes the greatest difference whether the case is aseptic at the time of operation. The condition of the fœtus must also be considered: if that has suffered through delay or the use of the forceps, Cæsarean section is preferable to symphyseotomy in so far as it offers almost instantaneous relief.

If delivery cannot be accomplished with the forceps with a reasonable display of strength, if the outer circumstances permit it, and if the fœtus is alive, symphyseotomy is indicated.

In regard to the use of version and extraction early in labor opinions are divided. It has been contended that the base of the skull, being narrower than the vertex, accommodates itself more easily to the brim of the pelvis. The after-coming head has plenty of room to bulge upward, but a presenting vertex is pressed right against the obstruction and, as it were, flattened out. On the other hand, there is this difference,—that with presenting vertex the head may have hours and even days to conform to the shape of the pelvis, while in extraction by the feet the accommodation must take place within a few minutes or the fœtus will die. The expeditious delivery is particularly difficult in a primipara whose parturient canal is narrow and not prepared for the passage of the fœtus. Often version is impossible, because the waters have drained off, the uterus is tetanically contracted around the fœtus, and the cervix not dilated. In other cases, again, the cervix and lower uterine segment may be so distended that, by introducing hand and arm, the accoucheur might bring about a rupture of these parts. But if the membranes are unruptured, or at least recently ruptured, good results may be obtained by version and extraction.

The following rules are based on a large experience in lying-in hospitals. Version is indicated:

1. When any danger for mother or fœtus necessitates speedy delivery at a time when the fœtus is still freely movable above the pelvic brim. Such conditions are, especially in regard to the mother, hemorrhage, exhaustion, cessation of uterine contractions, or fever, and in regard to the fœtus slow, weak heart sounds, and expulsion of meconium.

2. In cases of face presentation, brow presentation, or transverse presentation.

3. With a prolapse of the umbilical cord.

4. In a flat pelvis with a true conjugate of 3¼ inches (8 centimetres) if experience in former labors has shown that the patient had a particularly hard time or even gave birth to dead children.

5. In asymmetric pelves.

If, besides the shortening of the anteroposterior diameter, there is some diminution of the transverse diameter, a pelvis with a true conjugate of 3¼ inches (8 centimetres) practically becomes one of the second class, second group.

On the other hand, if the child is premature or small, a pelvis with a true conjugate of 3 inches or a little less (7½ centimetres) may be looked upon as belonging to the second group of the first class.

If during the manipulations of version the fœtus dies, the after-coming head should be perforated, which may be done through the spinal canal, an excellent method by which the mother is protected against all danger of being wounded.

If in the first group of the third degree of coarctation (a pelvis with true conjugate 2–2¾ inches—from 5 to 7 centimetres) the fœtus is dead and movable above the brim, it should be turned and its head perforated through the spinal canal. If the head is impacted, it is perforated through the vertex. If the fœtus is alive and perforation is decided upon, the same rules are to be followed. But it should be explained to the mother that she may give her child a chance of life by submitting to Cæsarean section. Still, if she is in too low a condition to stand the shock of this operation, it is more humane to sacrifice the fœtus and try to save the mother, or, if the conjugate is between 2½ and 3 inches (6½ and 7½ centimetres), to perform symphyseotomy.

In pelvic presentations the treatment is the same as that described above for the first degree and the first group of the second degree,—that is to say, to bring down a foot, extract, and, if necessary, to perforate.

In cases of *posterior ear presentation*, it is best to introduce the whole hand, seize the head and rotate it around the fronto-occipital diameter, so as to bring the sagittal suture back towards the promontory. If this does not succeed, version should be performed; but if the lower uterine segment and the cervix are too tense, the head must be perforated.

We have seen above (p. 273) that if the condition of the pelvis is known during pregnancy, it is better to induce *premature labor* in a pelvis whose true conjugate measures between 2¾ and 3½ inches (7–9 centimetres).

Artificial abortion has been resorted to in cases in which the true conjugate is so short—less than 2¾ inches (7 centimetres)—that a viable fœtus cannot be pulled through the genital canal. But, as we have stated above (p. 269), many are opposed to this operation on moral or religious grounds, and think the woman should take her chances with Cæsarean section.

In regard to *hunger cure*, in the hope of preventing dangerous operations, the reader is referred to what has been said on page 274.

B. *Rarer Deformities of the Pelvis.*

§ 1. **Asymmetric Pelvis.**—Pelves whose sacrocotyloid distance, which normally measures about 3½ inches (9 centimetres), differs materially on the two sides are called asymmetric.

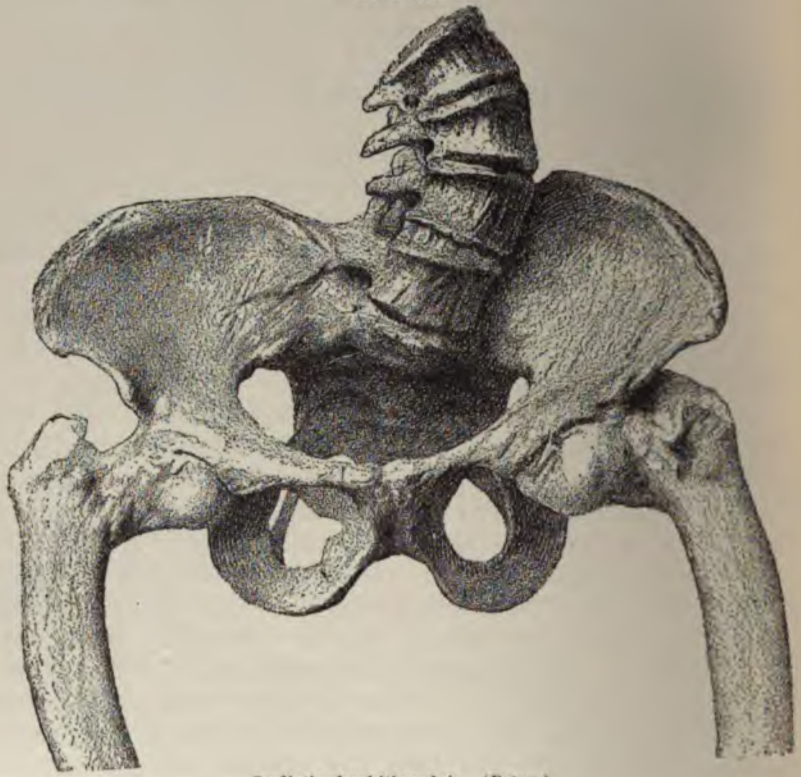
This class comprises three kinds of pelves,—(1) the scoliotic pelvis, (2) the obliquely contracted pelvis, or Naegele pelvis, and (3) the coxalgic pelvis.

1. The Scoliotic and the Scoliotic-Rhachitic Pelvis.—Scoliosis has obstetric importance only when the sacrum is implicated in it. The most common seat of the scoliosis is in the dorsal portion of the vertebral column, and is generally turned with the convexity towards the right side. It is in general compensated by a lateral curvature in the opposite direction in the lumbar portion of the column and has little or no influence on the pelvis. The scoliosis that is so common in girls after puberty and is caused by weak muscular development or an habitual faulty position, occurs at a time when the pelvis has lost much of the flexibility which characterizes it during childhood, and has therefore little influence on it compared with that of rhachitis. The form that opposes considerable obstacle to the passage of the fœtus is nearly always of rhachitic origin (Fig. 361).

This pelvis has the common characters of a rhachitic pelvis, but offers besides some peculiarities. The sacrum is transversely flat or even convex, and the whole bone is rotated on its longitudinal axis in such a way that the promontory is turned to the narrow half of the pelvis, generally the left. The narrow side corresponds indeed always to the side where the convexity of the lumbar curve is. The narrowness is found chiefly at the brim, but extends often more or less through the whole pelvis. The sacrocotyloid distance is diminished on the side towards which the sacrum is turned, and so is the oblique diameter of the opposite side, while the oblique diameter of the narrow side is lengthened. The ilium of the narrow side is pushed inward, upward, and backward, so that it stands more perpendicularly. The corresponding ala of the sacrum is narrow. The symphysis pubis is pushed over to the opposite side.

Minor degrees of this deformity are not rare and do not interfere seriously with childbirth, but sometimes one side of the pelvis is reduced to a mere gutter and counts for nothing from an obstetric stand-point. The pelvis is then virtually a generally contracted pelvis, the sacrocotyloid distance of the wide side representing the true conjugate and the oblique diameter corresponding to the transverse diameter.

FIG. 361.



Scoliotic-rhachitic pelvis. (Patay.)

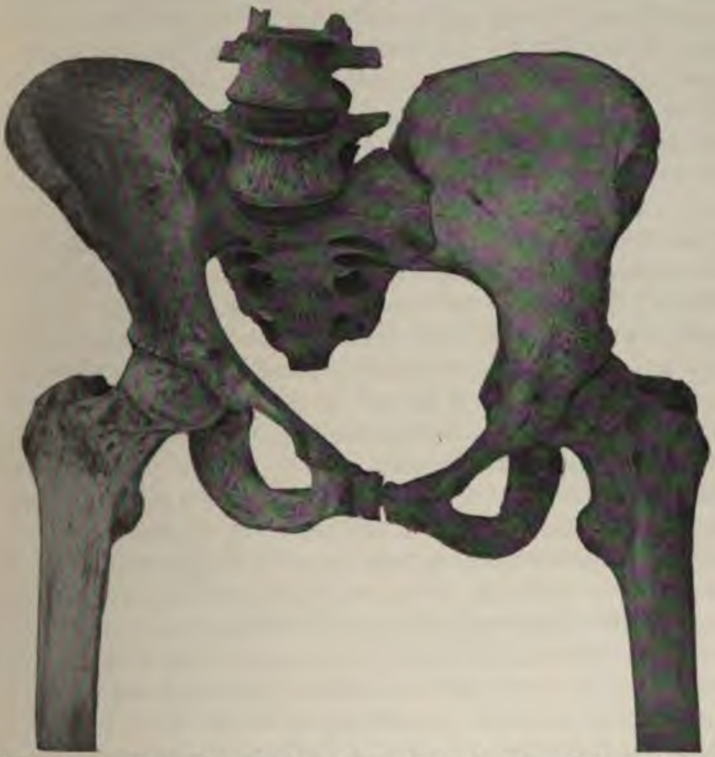
2. THE OBLIQUELY CONTRACTED PELVIS, OR NAEGELE PELVIS.—The distinctive feature of a Naegele pelvis (Fig. 362) is the atrophy of one lateral mass of the sacrum. As a rule, there is also a synostosis of the

iliosacral joint of the same side, and the superior strait of the pelvis forms an oblique oval, the narrow end of which lies at the atrophic ala.

Minor degrees of this deformity are probably not very rare, and are often overlooked because they do not give rise to obstetrical difficulties; but the higher degrees are decidedly rare and have been minutely described by some of the greatest obstetricians.

One lateral mass of the sacrum is little developed, in some cases so much so that the ilium almost joins the bodies of the original vertebræ composing the sacrum. The sacral foramina of this side and the auricular surface if it exists, or else the area that would correspond to it, are much smaller than those of the other side. The anterior surface of the bone is rotated around its longitudinal axis in the direction of the diseased side. The promontory looks the same way, and the lumbar portion of the vertebral column is scoliotic with the convexity turned in the same direction. With the lateral curvature is, as always, combined a torsion so that the bodies are rotated in the direc-

FIG. 362.



Obliquely contracted, ankylosed pelvis, or Naegele pelvis. (Wood's Museum, Bellevue Hospital, No. 173.) One-third actual size.

tion of the atrophic side and consequently the spinous processes in the opposite direction. The spinous process of the last lumbar vertebra is therefore approximated to the posterior superior spine of the ilium on the healthy side.

The symphysis is pushed over to the opposite side. The iliopectineal line is straightened on the diseased side and more curved than normal on the healthy side. The sacrocotyloid distance is shortened on the affected side and lengthened on the healthy one. On the other hand, the oblique diameter of the diseased side is lengthened and that of the healthy one shortened. Thus the entrance of the true pelvis has the shape of an egg placed obliquely, with the broad end turned forward in the healthy side and the narrow end backward at the defective ala and the sacro-iliac articulation.

In consequence of the deviation in opposite directions of the promontory and the symphysis pubis, the true conjugate is, as a rule, lengthened. The transverse diameter, on the contrary, is shorter than normal. The narrowness often extends through the pelvis and especially the transverse diameter is diminished. The hip-bone is pushed inward, upward, and in most cases backward. Generally there is a synostosis between this bone and the sacrum, and the line of union is marked by a smooth, bony ridge. The acetabulum is displaced upward and turned more forward. The pubic arch is shorter on the affected side and its gap is turned in this direction. The tuberosity and the spine of the ischium are nearer to the sacrum and the sciatic notch smaller than on the healthy side.

Having thus described the form of the Naegele pelvis as the obstetrician and anatomist find it in the grown-up woman, we shall try to understand how these numerous changes are brought about. The starting-point seems to be an original deficiency in the lateral mass of the sacrum due to lack of development, the falling out of some points of ossification. This would lead to the lumbar scoliosis and an obliquity of the pelvis by which the acetabulum is turned more downward, whereby it is exposed to greater pressure, the effect of which is to bring the hip-bone farther inward, upward, and backward, which again explains all the other changes.

In other cases inflammation in the articulation seems to have been the first disease, which later led to the atrophy of the sacrum. Pathologists are driven to the conclusion that there has been a primary iliosacral arthritis by the predominating signs of an old inflammation, which doubtless has been suppurative and may have started during intra-uterine life or after birth. Such signs of inflammation as osteophytes, fistulous tracts, or cicatrices, are found at the articulation and in its neighborhood. But also at a distance are often found osteophytes on the sacrum and the hip-bone.

The condition of the sacro-iliac articulation craves particular attention. In some cases it may never have existed. The defect that caused the poor development of the lateral mass of the sacrum may have involved the place where the articulation between the two bones should have been formed in fetal life. By progressive ossification the two bones melted together and the result was a congenital synostosis instead of an articulation. Such a primary ossification must be supposed to have taken place in pelves in which there is no backward displacement of the ilium.

In most cases, however, this displacement backward is manifest, and proves that the bones were bound together in a way allowing some degree of mobility. In these cases the theory is that the pressure on the acetabulum caused an inflammation, either of a purulent or an adhesive character, of the sacro-iliac joint, which led in course of time to the destruction of the articulation and a secondary synostosis. The inflammation of the joint may take a very chronic and painless course.

In rarer cases, again, the articulation was preserved and no synostosis followed. On the other hand, synostosis may be found in the rhachitic asymmetric pelvis. It is therefore no criterion of the Naegele pelvis. A synostosis may occur later in the life of the woman, but that has little influence on the form of the pelvis and is therefore without obstetric interest.

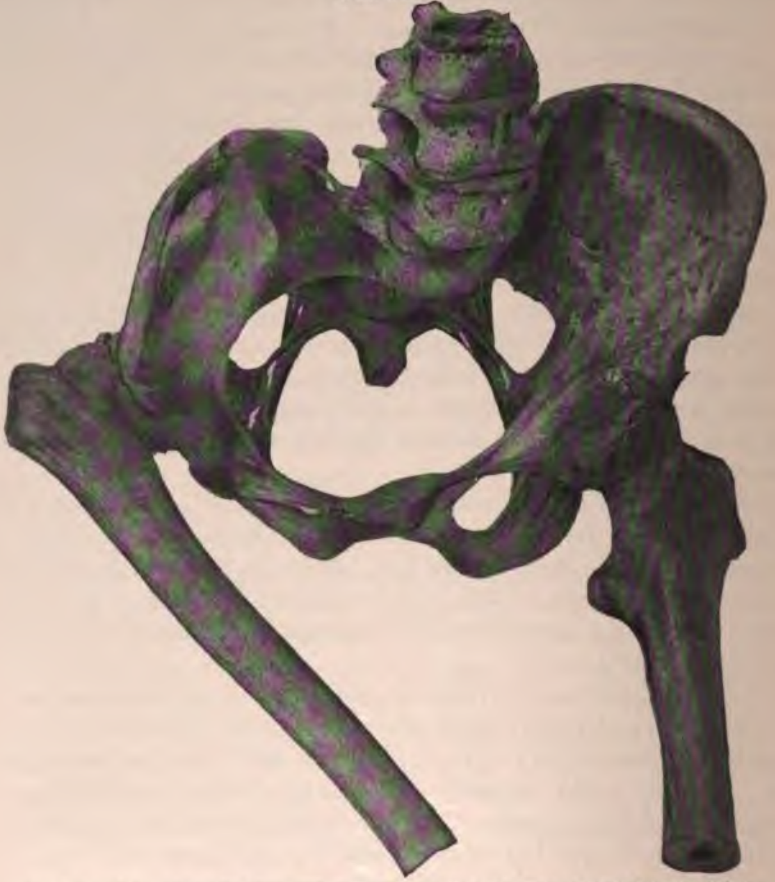
At the seat of the synostosis the texture of the bone is dense and hardened. The foramina nutritia may be diminished, which would interfere with the nutrition of the bone, and result in a secondary atrophy of the corresponding lateral mass of the sacrum. This, again, would lead to the above-described changes in the shape of the pelvis and the vertebral column.

3. Coxalgic Pelvis.—When for some reason an individual cannot during childhood make use of one of the lower extremities, or only uses it imperfectly, the weight of the body shifts over on the opposite side, and the healthy extremity exercises so strong a pressure that the pelvis becomes asymmetric; but in this case the oblique oval formed by the superior strait has its broad end on the diseased side (Fig. 363). The oblique diameter of this side is shortened (opposite to what takes place in a Naegele pelvis). The obliquity extends in most cases through the pelvic cavity. The most common affection that causes this form of pelvis is coxitis; but inflammation of the knee-joint, dislocation of the femur, infantile paralysis, the amputation of the limb, may have the same effect. All that is required is that the affection appears in childhood, while the pelvis is still soft, and that it lasts for some length of time.

If the child—*e.g.*, in congenital dislocation of the femur—rests more on the diseased side than on the healthy side, the oval is turned the other way. Then this half of the pelvis becomes the narrower one. The same will be the result if the healthy extremity is not used at all and there is some atrophy of the bones of the diseased side.

There is also a scoliosis, and, as a rule, the convexity turns to the healthy side, but there are exceptions. Generally, the pressure on the acetabulun produces some atrophy of the lateral mass of the sacrum on the same side in which the narrowing occurs.

Fig. 363.



Coxalgic pelvis. (Wood's Museum, Bellevue Hospital, No. 178.) One-third actual size.

The outlet is often distorted. The tuberosity on the healthy side, like the rest of the hip-bone, is pressed upward and inward, while that on the diseased side is pulled outward by traction from the muscles originating on it.

In the coxalgic pelvis the asymmetry is not so great as in the

Naegele pelvis, and therefore it does not oppose such dangerous obstacles to delivery. As a rule, the head passes without much difficulty with its occipitofrontal diameter through that part of the pelvis that has the longer of the two oblique diameters of the brim, and the outlet is wide from side to side, even if it is contracted in the anteroposterior diameter.

Diagnosis of Asymmetric Pelves.—In any woman who limps the pelvis should be carefully examined. Certain external measures may be of value in this respect. The most important is the distance between the spinous process of the fifth lumbar vertebra and the posterior superior spine of the ilium. Especially in Naegele's pelvis this is much shorter on the healthy side. Another measure is taken from the anterior superior spine of the ilium on one side to the posterior superior spine of the same bone on the other side, which distance normally measures 8½ inches (21 centimetres). A third measurement is the distance from the anterior superior spine of the ilium to the spinous process of the fifth lumbar vertebra, which normally is 7 inches (18 centimetres). A fourth measure is that from the lower end of the symphysis pubis to the posterior superior spine of the ilium, which normally is about 6 inches (15 centimetres). The difference on the two sides must be marked. A difference of less than half an inch (one centimetre) in these measures is without diagnostic value.

The internal examination must be carried out with the half or the whole hand. By it we feel the spine of the ischium to be nearer to the edge of the sacrum on one side than on the other and that the iliopectineal line is straighter on one side. We feel the promontory turned to one side and the symphysis to the other. In some cases we find the anterior and posterior walls of the pelvis on one side so approximated to each other that there is between them only a narrow gutter without obstetric value.

Prognosis.—The prognosis in asymmetric pelves depends more on the size of the pelvis than on its obliquity. Still, in the higher degrees of obliquity it is quite serious. Of the three kinds of asymmetric pelves we have distinguished, the Naegele pelvis with its defective sacrum is most dangerous and the coxalgic the least so. The pelvic presentation is bad for the child, but favorable for the mother, in so far as labor will be terminated earlier by perforation, and thus the great pressure on her soft parts avoided.

The mechanism of labor is peculiar and the knowledge of it of great importance for the treatment to be adopted. In moderate degrees of contraction the head may pass with its occipitofrontal diameter either through the narrow or through the wide side of the pelvis. The difficulty arises from the broad occiput. If there is room enough for the narrower forehead to pass through the narrow side, this offers the advantage that the occipitofrontal diameter of the head coincides with the longer oblique diameter of the pelvis. But if the coarctation is so great that the forehead cannot pass, the pelvis practically becomes a generally contracted pelvis, and the best chance is for the head to engage in the shorter oblique diameter of the pelvis.

When the head passes through the narrow side of the pelvis, the occiput sinks deep down so as to substitute the shorter suboccipitobregmatic for the longer occipitofrontal diameter, and the sagittal suture approaches the conjugate diameter even at the entrance of the pelvis. When the head enters the wide side, the occiput may take the same position, but this is not always the case, and the shortened oblique diameter of the pelvis may then offer too great resistance for the descent of the head.

At the outlet the head passes with least difficulty if the sagittal suture goes through the shorter oblique diameter.

In pelvic presentations the head passes most easily when the broad occiput is in the wide part of the pelvis.

Treatment.—If the patient is seen during pregnancy, premature labor should be induced if the true conjugate is less than three and three-quarters inches (9½ centimetres). But if the contraction is very great, Cæsarean section may be the only way of saving the child's life. If the child is dead, it should be turned, and the aftercoming head perforated. In the minor degrees of narrowness, it is best to wait and let the head descend some if the occiput is turned forward and the head stands in the longer oblique diameter, and then help it out with the forceps. If it does not yield to reasonable force, it should be perforated.

If the head does not engage, or if the occiput turns backward, or if the head stands in the shorter oblique diameter, it is best to turn the child in such a way as to bring the broad occiput down through the wide part of the pelvis and the forehead through the narrow part, in the longer oblique. It is possible to do this because the foot we pull on will turn forward under the pubic arch.

If we do not succeed with forceps or version, perforation must follow.

In a case of Naegele pelvis *ischiopubiotomy* has, however, been performed successfully for mother and child. (See OPERATIONS.)

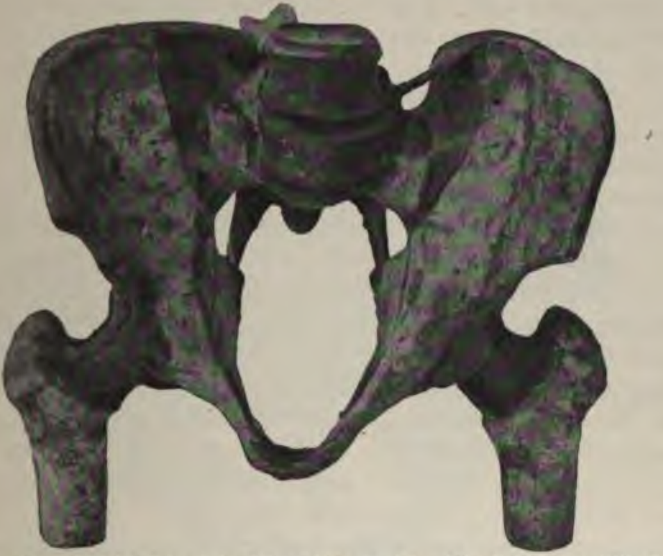
§ 2. **Transversely Contracted Pelvis.**—We come now to a class of pelves where the contraction is not found in the anteroposterior, but in the transverse direction.

To this class belong, 1, the *ankylosed transversely contracted pelvis* and, 2, the *kyphotic pelvis*, to which is nearly related, 3, the *funnel-shaped pelvis.*

1. THE ANKYLOSED TRANSVERSELY CONTRACTED PELVIS.—This form of pelvis is characterized by the ankylosis of both the sacro-iliac articulations (Fig. 364). It is, so to say, a double Naegele pelvis,—the atrophy of the sacrum and the synostosis with the ilium are found on both sides; and, as in the Naegele pelvis, it may originate in the defective bone formation or in the inflammation of the joint. It may be congenital or acquired. It is so rare that only half a score of cases have been reported.

The alæ of the sacrum are either altogether absent or in a very rudimentary condition. The bodies of the sacral vertebræ are also narrow, and the anterior surface of the bone, instead of being hollow, presents a convexity from side to side. In most of the few cases known of this deformity, the sacrum is situated low between the hipbones. The posterior superior spines of the ossa ilium stand much closer to each other than normal. These bones stand more perpendicularly. The iliopectineal line is little curved, nearly straight. At the symphysis pubis it forms an acute angle. The true conjugate is not much shortened or may even be longer than normal, but all the transverse diameters are greatly diminished. At the outlet it measures only between 1 and 2½ inches (2½–6 centimetres), and the branches of the pubic arch run nearly parallel to each other.

FIG. 364.



Ankylosed transversely contracted pelvis, or Robert pelvis. (Wood's Museum Bellevue Hospital, No. 166.) One-third actual size.

In the first pelvis of this kind known, the Robert pelvis in Wurzburg, the peculiar shape of the pelvis was referable to an injury sustained when the patient was six years old and was run over by a wagon. In this case and in one other—the Landouzy pelvis—the sacrum has not sunk down between the hip-bones. In these cases the bone had already a fixed position at the time the injury occurred. It was simply arrested in its growth and the inflammation in the sacro-iliac articulation caused by the injury resulted in synostosis.

In the other cases the sacrum is found situated deep in the pelvis. Here the process took place at a time when the pelvis was yet soft and flexible. The sacrum was pressed down by the weight of the upper part of the body. This would of itself tend to a tension and enlargement of the brim in a transverse direction, but, the alæ being absent, this effect was not very marked. On the other hand, pressure against acetabula contributed to the transverse narrowness of the pelvis. The descent of the sacrum would make the true conjugate shorter, but this is counterbalanced by the lateral compression, which would force the symphysis pubis forward and thus increase the length of the true conjugate.

Etiology.—As with the Naegele pelvis, in most cases the starting-point is to be sought in an original lack of development of the sacrum, and when we find this on both sides, and as a congenital condition, we can hardly fail to see it in the light of atavism, such transverse narrowness being unusual in the higher animals. The lack of development and the abnormal pressure that followed when attempts at walking were made resulted in inflammation of the joint and synostosis. In other cases, as in those of Robert and Landouzy, the inflammation was primary and led to the synostosis and the atrophy. In others again the synostosis was there from the beginning, no articulations having been formed in fetal life.

Diagnosis.—The diagnosis of a transversely contracted pelvis is easy. It is based on external measurements and internal examination. All the transverse measures—the distance between the trochanters, the anterior superior spines, the crests, and the posterior superior spines of the ilium—are shortened. The posterior surface of the sacrum is sunk so deep in between the ilia that the spinous processes can hardly be felt. At the internal examination one is struck by the narrowness of the pubic arch and the straight course of the iliopectineal line.

Prognosis.—The prognosis is bad. No viable human fœtus can be born through a transversely contracted pelvis.

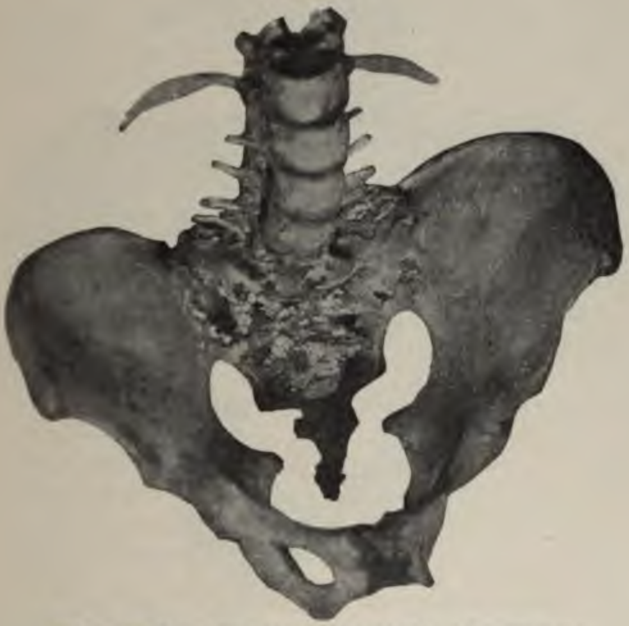
Treatment.—The only rational treatment consists in Cæsarean section.

2. Kyphotic Pelvis.—Kyphosis, or forward curvature of the spine, has in most cases little influence on labor. It is an old expe-

rience that hunchbacks have easy labors. This is because the common seat of the gibbosity is high up in the dorsal part of the vertebral column, which is compensated by a lordosis of the lumbar portion of the column. In this way the pelvis may escape all influence from the distortion of the spine. In order to produce a kyphotic pelvis the disease in the spine must be situated lower down. The purest type of kyphotic pelvis is found with kyphosis in the lumbar region. Furthermore, the disease must have made its appearance at an early age, when the pelvis was still very flexible.

The kyphotic pelvis is characterized by a large entrance and a narrow outlet. The author has given a detailed description of one

FIG. 365.



Kyphotic pelvis seen from above and the front. (Author's case.)

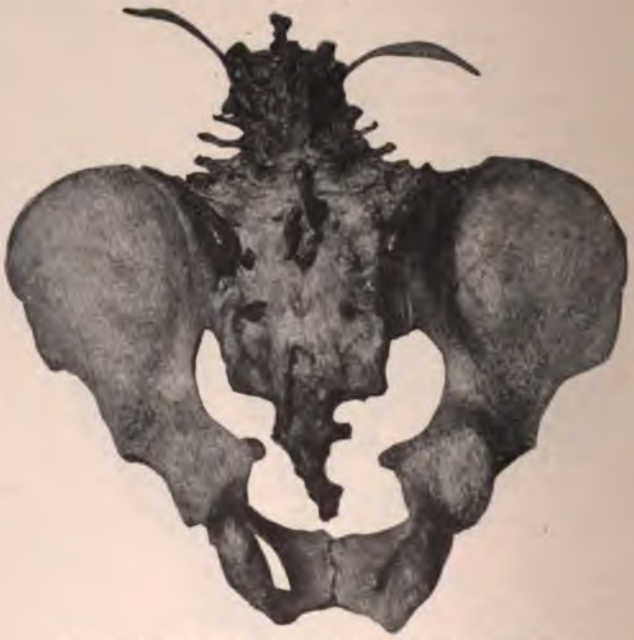
f a patient whom he delivered by Cæsarean section in preantiseptic imes[1] (Figs. 365–366).

Ordinarily the sacrum is long, narrow, strongly curved from side o side, at least in its lower part, and straight from above downward, vhile sometimes the upper part is convex from side to side. It is otated on its transverse axis so that the base sinks back between the liac bones and the apex forward. The inclination of the pelvis is very mall. The hip-bones are turned on an axis running in an anteroposterior direction, so that the false pelvis becomes large and the outlet of the true pelvis narrow from side to side. The brim of the pelvis is large, especially the true conjugate. The shape of the outlet varies according to the seat of the kyphosis. In lumbodorsal kyphosis the conjugate may be normal, or even elongated, but in lumbosacral it is always shortened. The side wall of the pelvis is high. The pubic arch is narrow, the symphysis pubis is situated high and pushed forward. In the neighborhood of the iliopectineal eminence the bone is much thickened. The iliopectineal line is less curved than normal. The spine of the ischium is turned sharply inward. The posterior superior spines of the ossa ilium are nearer to each other than normal and project less.

---

[1] Garrigues, "The Improved Cæsarean Section, containing the Description of Kyphotic Pelvis," Amer. Jour. Obst., April, May, June, 1883.

FIG. 366.



Kyphotic pelvis seen from behind and below. (Author's case.)

The mechanism by which these abnormalities in the shape of the kyphotic pelvis are produced is pretty well understood. The primary cause is a caries of one or more vertebræ. When the corpus of the vertebra is consumed, the weight of the superincumbent portion of the whole body causes the column to bend forward, forming an angle at the diseased part. The stooping produced in this way would be highly inconvenient and fatiguing, and instinctively the patient obviates the evil by carrying the head and the upper part of the trunk backward, whereby a lordosis is formed compensating the kyphosis situated lower down. Through the changed pressure the base of the sacrum is tipped back and its apex forward, whereby the conjugate of the brim of the pelvis is elongated and that of the outlet would be shortened if there were not other factors that counterbalance this effect. At the same time a compression from side to side takes place in the bone, the broadest part of the base, which is situated in front, being squeezed in between the posterior ends of the iliac bones, which are nearer together than the width of the sacrum, the result of which is the strong transverse curvature and the narrowness of this bone. The stretching in the longitudinal direction of the sacrum is doubtless due to the fact that pressure from above strikes its upper end under a more favorable angle, and, therefore, works with more power on that than on the part situated nearer the transverse axis around which the bone is being tilted, the strong ligaments between the sacrum and the ilium opposing a powerful resistance to the simple pushing back of the sacrum *in toto*.

We have seen that the stooping of the body was obviated by a corresponding lordosis formed above the seat of the kyphosis, but still another means is brought into action in order to bring the body into a more favorable relation to the ground when the individual is in the upright position. The whole pelvis is tilted backward, turning on an axis which goes through both hip-joints. This movement can only be executed by the contraction of the glutei-maximi muscles. But this backward tilting finds a check in the strong iliofemoral ligament. This ligament being constantly put on the stretch explains the development of the iliopectineal eminence and the adjacent mass of bone on which that ligament is inserted. The frequent abnormal contraction of the gluteus-maximus muscle draws down the posterior part of the ilium and makes it protrude as a convexity on the upper surface. When the base of the sacrum is tilted back, the strong sacroiliac ligaments are stretched and pull the posterior part of the ilium backward. The combined effect of the contracted glutei maximi muscles behind and the strained iliofemoral ligament in front is to push the head of the femur inward and upward. Hereby the os innominatum is stretched and its component parts are brought nearer to the corresponding points on the other side. Thus the conjugate diameters become lengthened and the transverse shortened in the middle and at the outlet of the pelvis. The posterior part of the acetabulum is pushed more backward, and thereby the spine of the ischium is turned more inward than would be the result of mere inward pressure towards the median line.

The tuberosities once brought nearer to each other by the tilting of the innominate bones will be still more approximated by the pressure exercised against them in the sitting posture.

In lumbosacral kyphosis the sacrum is short and narrow, and there is no real promontory.

Diagnosis.—The diagnosis is based on the presence of the kyphosis and on pelvimetry. The conjugate of the outlet is found by measuring the distance from the upper end of the pubic arch to the outer surface of the end of the sacrum, which normally is about 5 inches (12.3 centimetres), and subtracting ⅝ inch (1.5 centimetres). If there is an ankylosis between the sacrum and the coccyx, it is the distance from the apex of this latter bone which is to be taken. The distance from one tuberosity of the ischium to the other can also be measured directly.

Prognosis.—The prognosis is bad. It depends chiefly on the size of the outlet. The kyphotic pelvis is often combined with pendulous abdomen. Frequently the abdominal surface of the fœtus is turned forward, which probably is due to the retort shape of the uterus in the pendulous abdomen. The anterior part of the vertex with the large fontanelle is apt to descend. Even face presentations are comparatively frequent in this form of pelvis. A favorable circumstance is that the transverse diameter of the outlet is apt to become a little elongated during the passage of the child, which is due to mobility in the sacro-iliac articulation.

Treatment.—If the patient is seen during pregnancy, the induction of premature labor may be indicated. Since the contraction increases downward, the head will descend some and then stick. If the transverse diameter is not too short, the accoucheur may be able to pull the head through with the forceps. But if the transverse diameter is less than 3¼ inches (8 centimetres), the forceps becomes a dangerous instrument. The vagina may be torn, articulations ruptured, or the pelvic bones fractured. Under such circumstances it is better to perforate or to resort to Cæsarean section before any other attempt is made. Symphyseotomy has also been tried, but is less reliable, since it is hardly possible to calculate how much space will be gained at the outlet.

RHACHITIC KYPHOTIC PELVIS.—As we have seen, the common cause of a kyphotic pelvis is Pott's disease, tuberculosis of the vertebræ. Much more rarely the kyphosis is due to rhachitis. Since the rhachitic pelvis usually has a form that is almost the opposite of that of the kyphotic, a curious mixture results when the two are combined. Nearly all the characteristics of a rhachitic pelvis are lost, except that the ilia are small and wide open in front, leaving a long distance between their anterior superior spines, and that the sacrum is flat from side to side instead of being strongly curved.

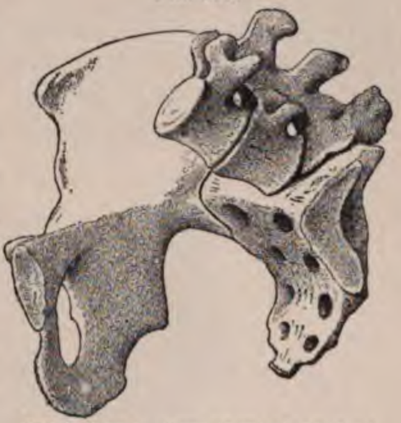
If the kyphosis is situated in the dorsal region, there is a compensating lordosis in the lumbar region, and the pelvis becomes a common rhachitic pelvis.

KYPHOSCOLIOTIC RHACHITIC PELVIS.—The pelvis becomes still more peculiar if to the kyphosis is added scoliosis in a rhachitic person. This combination produces a more or less pronounced asymmetric pelvis. On the side of the scoliosis the inclination of the pelvis is small, while the opposite side is much inclined. At the outlet the obliquity is generally just the opposite of what it is at the brim.

PELVIS OBTECTA (FEHLING), OR SPONDYLIZEMA (HERRGOTT).—When the kyphosis is situated between the sacrum and the lumbar vertebræ or exclusively in the sacrum, the vertebral column may be so much bent forward as to cover the entrance of the pelvis (Fig. 367).

In consequence of osteitis, generally of tuberculous nature, the bodies of the vertebræ affected become rarefied and are crushed together by the weight of the upper portion of the body. The remnants of the vertebral bodies and the arches form a wedge which enters the column from behind and drives it forward. From an obstetric stand-point the true conjugate becomes then the shortest distance from the symphysis to the vertebral column. This distance has been found reduced to 1½ inches (4 centimetres).

FIG. 367.



Pelvis obtecta. (Tarnier and Budin, l. c.)

The women who have such a pelvis are unable to stand upright. Sometimes they may obtain their equilibrium by bending the knees. If they stretch the lower extremities, they are obliged to seek support for their bodies on canes, which they carry in their hands, so that they virtually are reduced to quadrupeds.

3. FUNNEL-SHAPED PELVIS.—A funnel-shaped pelvis (Fig. 368) is one that is comparatively large at the brim and narrow at the outlet. Most funnel-shaped pelves are the result of lumbosacral kyphosis and have been considered above. But in some cases a similar shape is found in women who have a normal spine. The contraction is generally moderate in degree and found only in the transverse direction, but it may extend over a large portion of the pelvis, and if there is an ankylosis between the sacrum and the coccyx the space is considerably diminished.

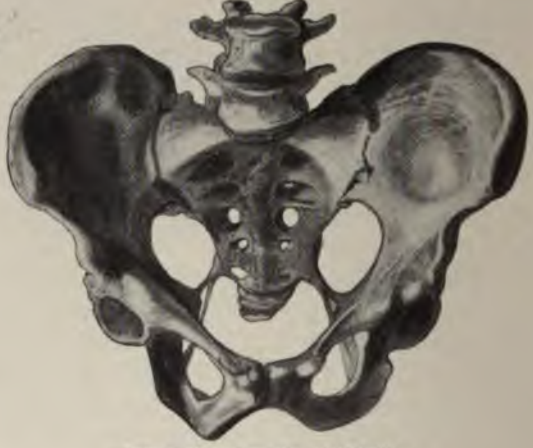
Etiology.—In England this form of pelvis has particularly been met with among society ladies, and is attributed to frequent horseback riding indulged in at a tender age, when the pelvis is still pliable. At all events it is probably a modification of an infantile pelvis.

Diagnosis.—The funnel-shaped pelvis is hardly known to exist before delivery. Then attention is called to it by the head sticking in the cavity of the pelvis. Exact measurements as described under kyphotic pelvis clear up the diagnosis.

Prognosis.—As the contraction in most cases is of moderate degree, the prognosis in general is not bad. Still, infantile mortality is much increased, and even the mother is exposed to considerable danger. If the head is not helped out in time the soft tissues become inflamed and gangrenous, and the result may be a vesicovaginal fistula or a stricture of the vagina, or even the bones forming the pubic arch fall a prey to caries. If the distance between the tuberosities of the ischia is less than 3½ inches (9 centimetres), the situation is grave.

Treatment.—If the existence of a funnel-shaped pelvis is known or recognized during pregnancy, it may be proper to avoid trouble by the induction of premature labor. During labor a prompt recourse to the forceps is indicated, but if the impacted head does not soon yield to a reasonable amount of traction, and the fœtus is alive, symphyseotomy is likely to give all the enlargement needed in the transverse direction. Too protracted traction may lead to fracture of the pelvis, rupture of its articulations, or serious tears of the soft parts. Cæsarean section will hardly ever deserve consideration. If the fœtus is dead, craniotomy or cephalotripsy should at once be performed in the interest of the mother.

FIG. 368.



Funnel-shaped pelvis. (Ahlfeld.)

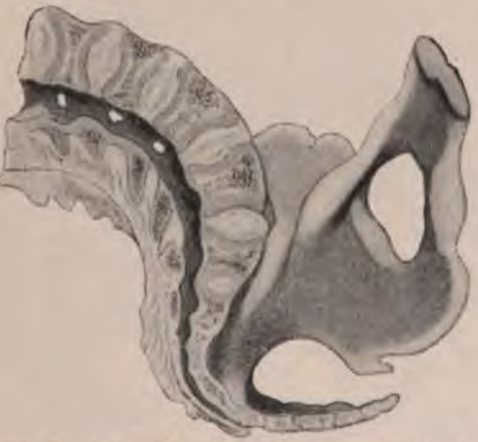
§ 3. **Incurved Pelvis.**—In the incurved pelvis the walls, instead of being bent outward, are curved inward.

To this class belong, 1, *the osteomalacic pelvis* and, 2, *the pseudo-osteomalacic rhachitic pelvis.*

1. **The Osteomalacic Pelvis.**—The osteomalacic pelvis is the result of a disease called *osteomalacia*, which is characterized by a softening of the bones. Unlike rhachitis, with which it formerly was confounded, it is a disease of the adult. It generally makes its appearance when the patient is between twenty-five and thirty-five years of age. It is by far more common in women, but is also found in men, and is most frequently connected with pregnancy, the puerperal state, and lactation. It is, however, found also in nulliparous women. Sometimes there are exacerbations at the menstrual periods, but the disease may make its first appearance after the menopause.

The calcareous matter in the bones is absorbed, and the medullary substance is encroaching upon the bone. Two forms of the disease have been distinguished,—viz., *osteomalacia cerea*, or waxy osteomalacia, and *osteomalacia fragilis*, or brittle osteomalacia; and the distinction is, as we shall see, of importance for the practical obstetrician; but in reality it is only a question of degree of the same destruction. If the inner portion of a bone is affected and there remains a thin bony shell, this is very liable to break, while if the bone is softened in its whole mass, it will bend and be flexible as wax.

Fig. 369.



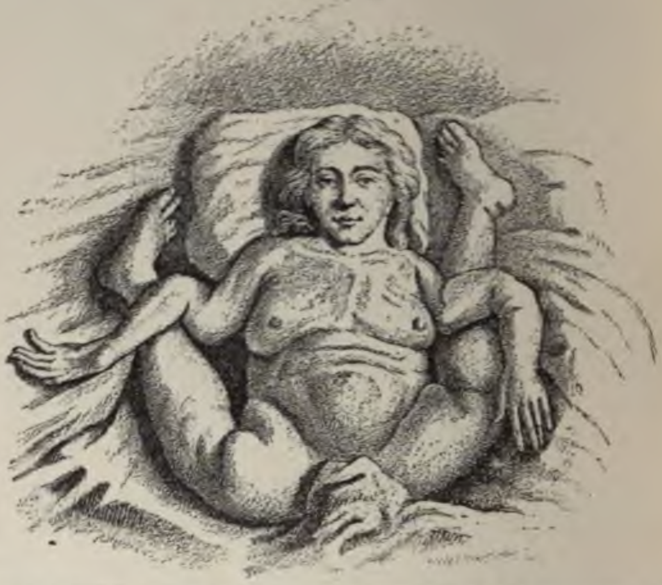
Sagittal section of an osteomalacic pelvis, showing disappearance of bony tissue. (Ahlfeld.)

The disease usually begins in the pelvis or the spine (Fig. 369), but it may gradually implicate most of the skeleton (Fig. 370).

The *osteomalacic pelvis* is very characteristic. On account of the disappearance of the lime salts from the composition of the bone, it is of very light weight, incurved, and often fractured. The same factors that go to give a normal pelvis its shape—the superimposed weight, the pressure of the femora against the acetabula, the resistance of ligaments, and the traction of muscles—are at work here, but, being exercised on flexible or brittle bones, they find no resistance, and the result is that the walls of the pelvis are bent or crushed inside into the cavity (Figs. 371, 372).

The promontory is pressed forward and downward. The sacrum is strongly curved longitudinally, the apex being turned forward. The acetabula are approximated, the ascending branch of the pubis bent inward, likewise the pillars forming the pubic arch, so that the symphysis pubis protrudes forward like a trunk. The tuberosities of the ilia are brought nearer to each other, and may even come in contact with each other. The anterior portion of the ilium is turned inward and downward. The brim of the pelvis has the shape of the letter Y, the sacrocotyloid distance and the transverse diameter being much diminished. There is also some asymmetry in the pelvis. The deformity increases in the course of time, especially in consequence of repeated pregnancies. It may become so great that a marble one inch in diameter cannot pass through the pelvis. Coition may become impossible and defecation difficult.

Fig. 370.

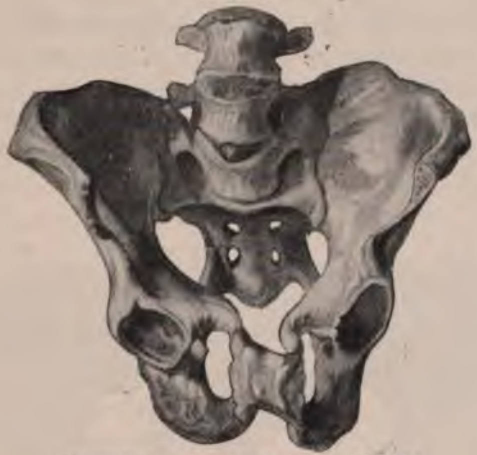


Woman affected with osteomalacia. (From an engraving in the Musée Dupuytren in Paris.)

Osteomalacia being exceedingly rare in this country, I add an illustration of a specimen in Wood's museum (Fig. 373), although the deformity is less pronounced.

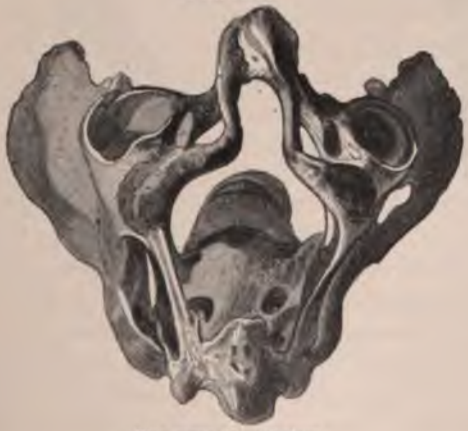
Symptoms.—In the beginning the disease is obscure. The first symptom complained of is pain in the bones of the pelvis or spine, which pain is increased by pressure. There soon appears a difficulty in lifting the leg or abducting it, which causes a stumbling and waddling gait. The knee-jerk is increased. There is tremor of the muscles. Next the stature is shortened and bones become soft and flexible or brittle. Even the soft tissues may become friable, several operators having reported that the ligatures cut through when applied.

FIG. 371.



Osteomalacic pelvis, front view. (Ahlfeld.)

FIG. 372.

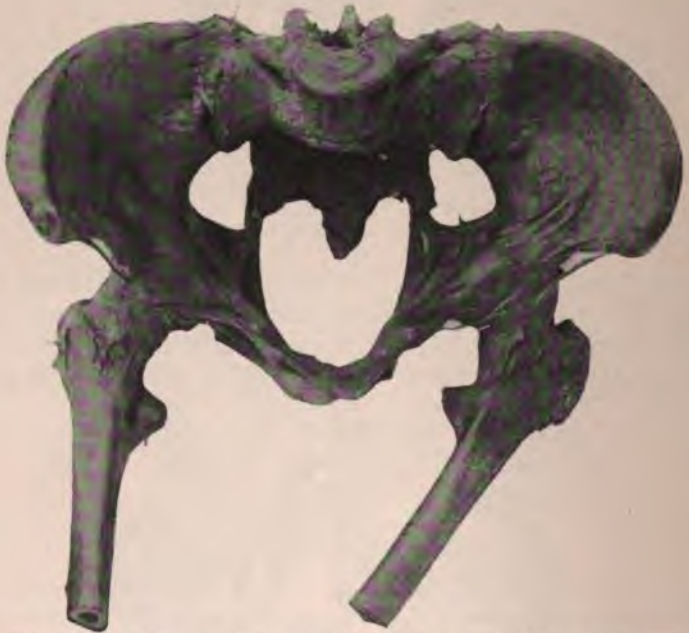


The same from below.

Etiology.—The cause of the disease is unknown, and there is great diversity of opinion as to its true starting-point. Some look upon it as an osteomyelitis. Others go still further back and suppose that the cells of the spinal marrow are first affected. Others, again, see the cause in a pathologic metabolism.

Osteomalacia is endemic in some rather limited localities in Europe,—the borders of the Rhine near Cologne, and again near its outlet in Flanders, Schütt Island in the Danube, and the valley of the Po in northern Italy. In America it is exceedingly rare. A low, damp residence seems to be a feature of importance in its causation. The bones have been searched in vain with the modern tests for bacteria. The ovaries seem to have a decided influence on the production of the disease. Sometimes they were found in a hyaline condition, but in other cases they were perfectly normal. Perhaps they, like other glands, have an internal secretion which is an important link in the chemistry of the organism.

Fig. 373.



Osteomalacic pelvis. (Wood's Museum, Bellevue Hospital, No. 154.) One-third actual size.

It has been found experimentally that when the ovaries are removed from a healthy animal, the excretion of phosphates in the urine is much diminished. It is also clinically proved that oöphorectomy and the administration of phosphorus are most effective in arresting the disease. The removal of the ovaries therefore saves phosphorus, and they are suspected, when present, of causing osteomalacia by too great oxidation and elimination of phosphorus. It must, however, be remembered that the disease may be found in men. What is sure is that pregnancy, the puerperal state, and lactation have a decidedly bad influence on the progress of the disease, but it may be found in women who have never borne a child, and it may begin after the menopause.

Poor food may contribute to the production of the disease by lowering the tone of the whole constitution, but does not in itself cause osteomalacia, which, on one hand, may attack well-fed persons, and, on the other hand, is nearly unknown in Ireland and parts of Russia among a large population living in abject poverty.

Diagnosis.—In the beginning osteomalacia is not easily recognized and is often taken for *rheumatism* or *spinal disease*. A point of diagnostic importance is that the pain is seated in the bones, especially the sacrum, the hip-bones, the vertebræ, and the ribs, and is increased by pressure.

Rickets is a disease of early childhood, osteomalacia appears after the skeleton is perfectly ossified. In rickets the epiphyses of the bones are thickened, while in osteomalacia they are of normal dimensions. In rickets there is not much pain, whereas pain is a chief symptom in osteomalacia. In rickets the lower extremities are more distorted than any other part of the body, while in osteomalacia they often escape.

The increased knee-jerk and the impaired power of bending the legs on the abdomen and of abducting them help to diagnosticate osteomalacia at an early date. When the stature diminishes and deformity sets in, the diagnosis is easy. As to the pelvis, it is a point of great diagnostic importance that the woman may have given birth to children without difficulty before the beginning of the disease which may distort her pelvis to such an extent that she can be delivered only by Cæsarean section. It is true, *carcinoma* of the bones of the pelvis may produce a similar condition, but then there is a history of previous carcinoma in some other portion of the body.

The diagnosis of the osteomalacic pelvis is in the beginning not always easy, and can only be made with the half or whole hand, but later the type is easily recognized. From the lumbosacral kyphotic pelvis it is distinguished by the well-defined protruding promontory, the strong curvature of the sacrum, the inward curvature of the ilium, the Y-shape of the brim, and the trunk-like symphysis. The promontory may be so low that the common iliac arteries are felt pulsating, which has been given as a sign of spondylolisthesis; but then the whole shape of the pelvis is entirely different from that of the spondylolisthetic pelvis, as we presently shall see.

The diagnosis between the two varieties, osteomalacia cerea and osteomalacia fragilis, is of importance in regard to prognosis and treatment. In the flexible variety it is often possible, without causing much pain, to separate the tuberosities of the ischia or to bend the crest of the ilium back towards the spine.

Prognosis.—The prognosis is much better now than it was twenty-five years ago. We know that the disease is curable, and we have gained considerable control over it by medical and surgical means.

In regard to labor, not a few cases end favorably by nature's sole efforts. Others demand more or less dangerous operations or may lead to death by rupture of the uterus. In half of the reported cases the patient succumbed.

Treatment.—Taking into consideration the gravity of labor and the unquestionably bad influence of pregnancy and the puerperal state, the writer takes it to be justifiable to provoke abortion if the case is seen so early that the fœtus can be easily removed by the natural way. After that the patient should occupy a dry, sunny house and have as substantial food as possible, of which milk should form a large ingredient. The chief remedial agent is phosphorus, of which gr. $\frac{1}{20}$ to $\frac{1}{15}$ (3–4 milligrammes) should be taken three times a day. Another important remedy is the extract of red bone marrow, a tablespoonful three times a day. Cod-liver oil is also said to have effected a cure. Protracted and repeated inhalation of chloroform has in some cases proved very effective, while in others it has been useless. Frequent tepid baths with chloride of sodium or sulphur may be used as adjuvants. They relieve pain and keep the skin in good condition. It need hardly be added that pregnancy should be avoided, in which respect the only reliable methods are abstinence from sexual intercourse or the use on the male organ of a rubber protector.

If, in spite of prophylaxis, diet, regimen, and drugs, the disease is not cured, recourse should be had to surgical means. The ovaries should be removed, and perhaps it is still better to amputate the uterus at the same time.

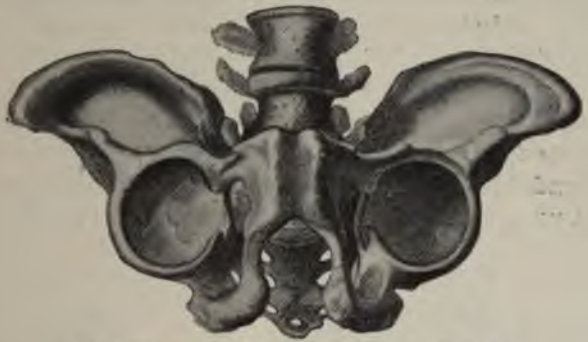
If the patient is seen late in pregnancy, our conduct must depend on the degree of deformity present and the variety of the disease. If there is only slight deformity, and if the disease is of the flexible variety, perhaps the induction of premature labor may be indicated. In the higher degrees of deformity Cæsarean section should be performed a couple of weeks before the normal end of pregnancy.

Finally, if the case comes under observation after labor has begun and the deformity is great, Cæsarean section should be performed at once. If, on the other hand, there seems to be room for the child to pass, we may hope that the bones may yield some, and see what nature can do. If necessary, we help with the forceps or perforate and extract with forceps or cranioclast.

When Cæsarean section is performed the ovaries should be removed so as to prevent future impregnation and eliminate the deleterious influence of these glands on the metabolism; or the uterus may be amputated at the internal os or totally extirpated.[1]

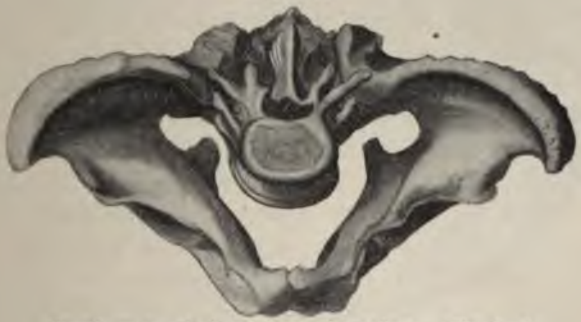
2. PSEUDO-OSTEOMALACIC RHACHITIC PELVIS.—A form of pelvis much like the osteomalacic may be produced by rhachitis, and is then called the pseudo-osteomalacic pelvis (Figs. 374, 375). The brim is triangular, the acetabula are pressed inward, the symphysis protrudes forward, the ascending branch of the pubis is bent inward, the tuberosities of the ischia are approximated to each other, and the pubic arch is narrow. The rhachitic origin is shown by the smallness of the bones, especially the ilium, their flat position, and, as a rule, their anterior gaping; but sometimes even that may be absent, and the anterior part of the ilium may be turned inward as in osteomalacia. The bones of the pelvis are more compact, solid, and heavy. The most distinctive point is, however, to be found in the history, rhachitis

FIG. 374.



Pseudo-osteomalacic pelvis, front view. (Clausius.)

FIG. 375



Pseudo-osteomalacic pelvis seen from above. (Clausius.)

---

[1] Garrigues, Diseases of Women, third ed., p. 517.

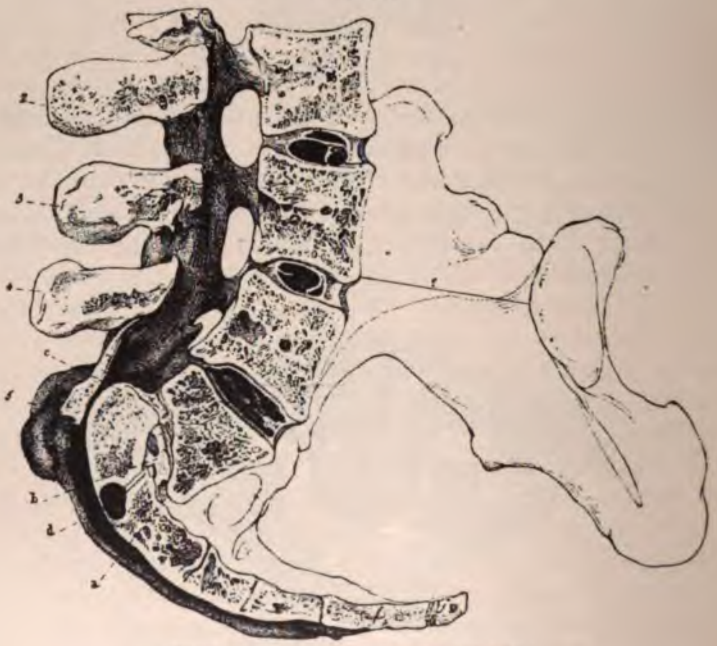
being a disease of childhood, appearing before ossification is finished, and osteomalacia occurring in the adult and consisting in the emollition of the already hardened bone. Exceptionally, there may, however, with the rhachitis, be an osteoporosis, a reabsorption of already formed bony tissue; but that is then really a combination of osteomalacia and rhachitis.

The pseudo-osteomalacic pelvis is produced if the lower extremities are much used at a time when the pelvic bones are very soft in consequence of rhachitis.

It is a very rare form of pelvis. The coarctation may be quite considerable, and the same rules apply to the conduct of the obstetrician as in osteomalacic pelvis.

§ 4. **Spondylolisthetic Pelvis.**—The word *spondylolisthesis* means sliding of a vertebra. A spondylolisthetic pelvis (Fig. 376) is one in which the body of the fifth lumbar vertebra has slid forward into the upper strait and the cavity of the pelvis, where it leans against the anterior surface of the first or even the two uppermost sacral vertebræ. The spinous process stays in its place and so does the inferior articular process, while the superior goes with the body. This is only possible by an elongation or a fracture taking place in the arch of the

Fig. 376.



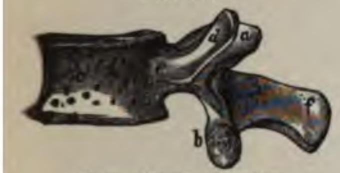
Spondylolisthetic pelvis. (Olshausen-Veit.)

vertebra (Figs. 377, 378). As a rule, this is a slow process, due to imperfect ossification and the carrying of heavy weights, but a similar condition results if through injury the vertebra is broken suddenly, as on the woman whose pelvis is seen in Fig. 78, p. 108.

When the vertebral body slides down in front of the sacrum, the intervertebral cartilage atrophies and disappears, the bones become smoothed off through pressure against each other, and sometimes they grow together, when further sliding, of course, is rendered impossible. Although this is one of the rarer deformities, a considerable number of spondylolisthetic pelves have of late years been observed and described.

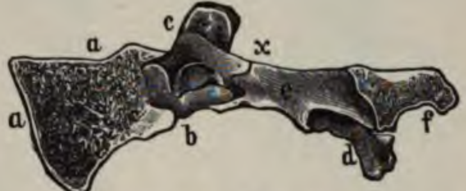
The displacement of the vertebra has very serious consequences, both in regard to the spinal column and the shape of the pelvis. By the sliding the centre of gravity is brought farther forward. In order to compensate this disturbance the trunk bends backward and the lumbar portion of the vertebral column forms a strong convexity forward. This lordosis obstructs the entrance of the pelvis, so that the nearest point to the symphysis pubis may be found on the fourth, the third, and even the second lumbar vertebra, and this distance measures only between 2 and 3 inches (5 and 8 centimetres).

FIG. 377.



Normal lumbar vertebra.

FIG. 378.



Lumbar vertebra with elongated interarticular portion. (Neugebauer.)

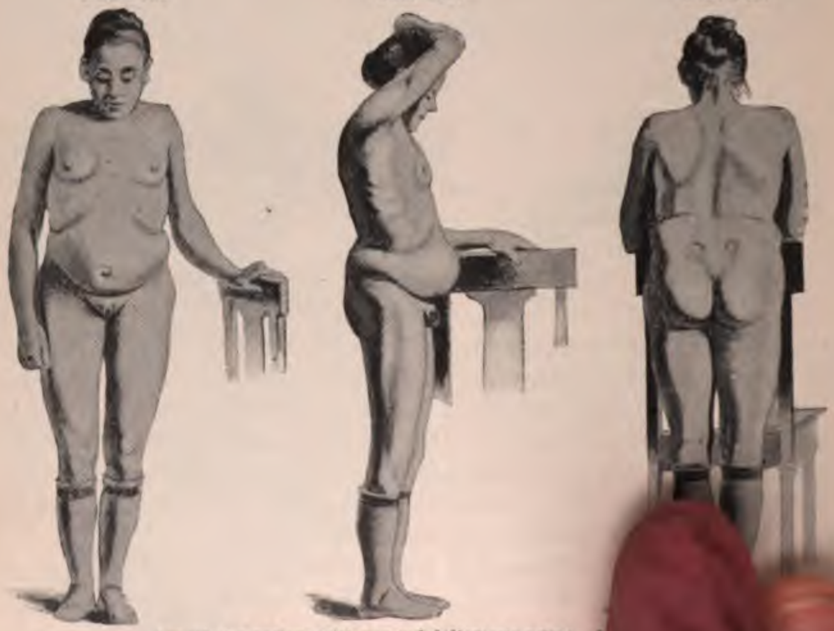
In the pelvis great changes of form are inaugurated. By the pressure exercised by the vertebral column the sacrum is tilted around a transverse axis so that the upper end is pushed back and the apex forward. The base is driven backward, and must as a wedge separate the posterior spines of the ilia from each other. The apex is driven in the direction of the pubic arch and shortens the anteroposterior diameter of the outlet. The upper ends of the hip-bones being driven farther apart, the lower ends must be brought nearer together. Consequently the distance between the tuberosities of the ischia is diminished. The outlet is then diminished both in the anteroposterior and in the transverse diameter.

At the brim, the fifth lumbar vertebra lying in front of the sacrum, the conjugate becomes shortened, while through the spreading apart of the hip-bones the transverse diameter becomes somewhat elongated.

When the weight of the trunk is brought forward, a compensatory movement takes place in the pelvis. It is lifted in front and tilted backward around a transverse axis. In this way the inclination of the pelvis becomes much diminished. But thereby the iliofemoral ligament becomes stretched, and that again pushes the femora against the acetabula and contributes to the approximation to each other of the tuberosities of the ischia.

Etiology.—As a rule, there is a congenital predisposition. But perhaps even the carrying of great weights can force a normal vertebra out of its connection with the adjacent bones. In many cases the displacement is due to injury, especially in youth.

Fig. 379. Fig. 380. Fig. 381.



Aspect of a patient with a spondylolisthetic pelvis. (

Diagnosis.—The diagn ifficult. Oft
of the patient suffices to 379, 380,
and legs are normal, bu emarkable
abdomen, the upper part nking into
lower hanging forward ov sis. On ac
inclination of the pelvis th and the
more upward and forward. too lar
form over the crests of the
are deeply pressed forward, a
ward.

By vaginal examination the obstetrician feels the displaced vertebra in front of the sacrum. On account of the small inclination of the pelvis the common iliac arteries or even the end of the abdominal aorta may be felt, but that may also be the case in lumbosacral kyphosis.

A low degree of pelvic inclination, which constitutes such a prominent feature of the spondylolisthetic pelvis, is also found in lumbosacral kyphosis, in osteomalacia, and in rhachitis, but there are distinctive features of each of these conditions. None of them produces the peculiar shape of the abdomen just described.

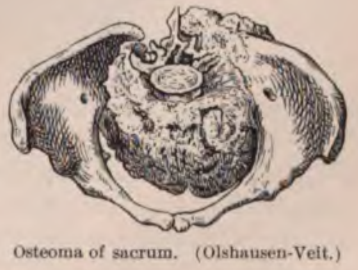
In *kyphosis* there is the external gibbosity. There is no hollow back. The false pelvis is large; the promontory is little marked, or cannot be reached at all. The alæ of the sacrum cannot be reached.

The *osteomalacic* pelvis has the protruding symphysis, the narrow pubic arch, and the Y-shaped brim. The sacrum is strongly curved longitudinally. The ilia are curved inward in their anterior portion.

As to *rhachitis*, it may be difficult to decide whether the hollow felt under the promontory is due to the curvature of the sacrum itself, as in rhachitis, or to the displacement of the lumbar vertebræ in regard to the sacrum, which characterizes spondylolisthesis. But first of all, we have the history of rhachitis in childhood. Next, we observe characteristic pathological changes in the skeleton,—curved legs, thick wrists, chicken-breast, etc. Finally, by following the linea terminalis from the promontory, we feel the alæ of the sacrum form a direct continuation of it, while in spondylolisthesis we feel only the displaced vertebra, and beyond it the alæ of the sacrum, but not as a continuation.

Prognosis.—The prognosis of spondylolisthesis is bad. The narrowness extends over a large area, and may be very considerable. Coarctation may begin high up in the abdomen. Great resistance is met at the brim, and the outlet is considerably contracted in both directions.

FIG. 382.



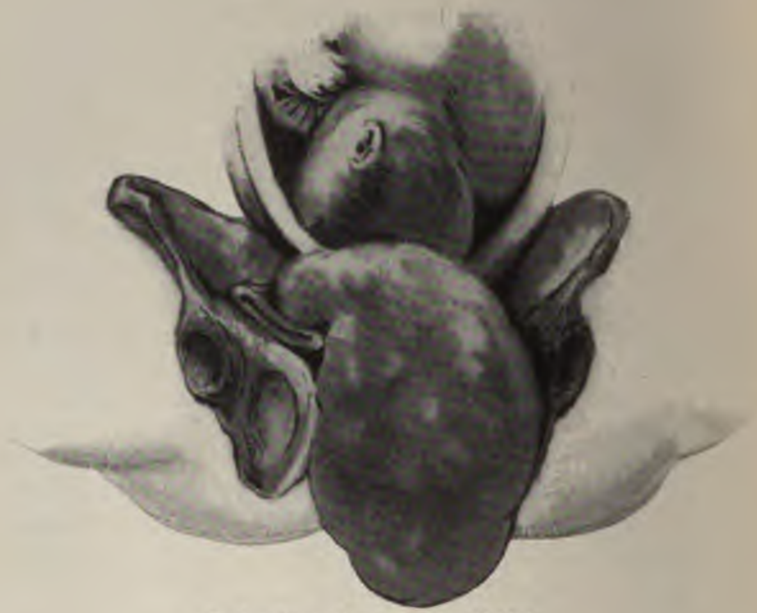
Osteoma of sacrum. (Olshausen-Veit.)

Treatment.—Artificial abortion, induction of premature labor, or Cæsarean section will be indicated in most cases. The obstetrician must calculate the length of the substituted true conjugate, and, on account of the extension of the narrow portion, demand half an inch (one centimetre) more than he would in a flat pelvis before allowing to be established.

5. Pelvis Contracted by Tumors springing from the Pelvic —Large tumors attached to the interior walls of the pelvis may practically obliterate it from an obstetric stand-point. In Fig. 382 is represented an osteoma of the sacrum, in Fig. 383 an enchondroma of the same. In other cases the tumor was fibrous, sarcomatous, or carcinomatous.

These occurrences are exceedingly rare, and each such case must be judged on its own merits, but, as a rule, Cæsarean section is the only available method of delivery.

FIG. 383.



Enchondroma of sacrum. (Stadfeldt.)

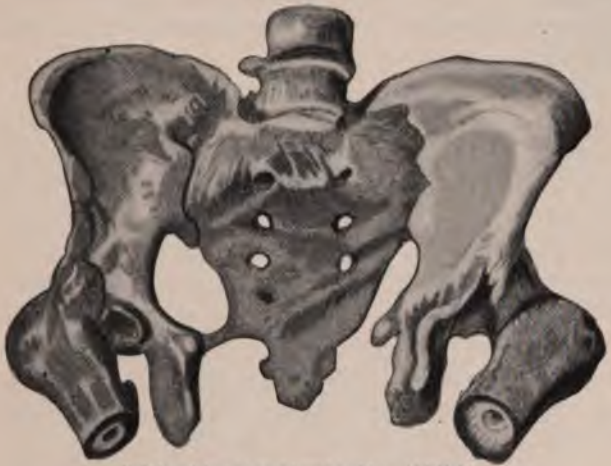
§ 6. **Split Pelvis.**—The pelvic ring may be open at the site of the symphysis pubis or at that of the sacrum.

1. PELVIS SPLIT AT SYMPHYSIS PUBIS.—In early fetal life the pedicle of the allantois, which forms the bladder, may be over-distended with fluid and rupture. In consequence of this the bladder remains open in front—so-called *exstrophy of the bladder*—and the symphysis is only formed by strong ligaments, which admit movements of the ends of the pubic bones.

Most of such children are stillborn or die early in life. Those who survive have a constant dripping of urine from the exposed ends of the ureters, and are not very likely to become impregnated.

The pelvis with split symphysis (Fig. 384) makes the impression of being somewhat flat, which must be due to the resistance offered by the strong ligaments uniting the bones in front.

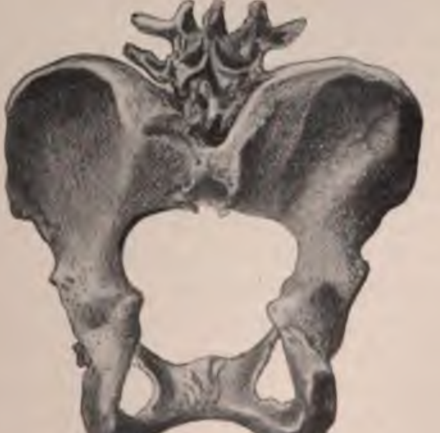
FIG. 384.



Pelvis without symphysis pubis. (Ahlfeld.)

In the few cases of labor in a pelvis with split symphysis that have been reported, artificial help was needed on account of inability of using the abdominal pressure or a faulty presentation of the fœtus.

FIG. 385.



Pelvis without sacrum. (Litzmann.)

In several a very narrow vaginal entrance necessitated deep incisions. In one case symphyseotomy was performed by cutting the ligaments replacing the symphysis. One woman was delivered with the forceps.

2. PELVIS SPLIT AT SACRUM.—The posterior breach in the pelvic ring is produced by deficient development of the sacrum (Fig. 385) or by surgical removal of the bone.

The few specimens known in which the sacrum was rudimentary were of the infantile type. One case occurred after extirpation of the sacrum. The mechanism of labor was normal, and a large child was born without difficulty.

§ 7. **Too Wide Pelvis.**—After having dwelt so long on pelves that are too small, it is quite a relief to come to one that is too wide. But the old rule, *ne quid nimis*, holds good. Too great dimensions of the pelvis may as well become a source of dystocia as too small ones. In the first place, too wide a pelvis favors precipitate labor, with all its dangers to mother and child,—hemorrhage, laceration, or syncope, avulsion of the umbilical cord, injury to the child's head, etc. (see pp. 359, 360). Secondly, too much space interferes with the normal mechanism of labor, and may become the cause of faulty positions that demand operative interference. Thus, occipitoposterior and occipitolateral positions (p. 362 *et seq.*) are frequent accompaniments of the too wide pelvis.

CHAPTER X.

HEMORRHAGE.

SOME loss of blood is normal in childbirth, but if it passes certain limits, it is one of the most serious complications, and so much more terrific as the hemorrhage may be so profuse that the patient succumbs almost without warning. The obstetrician should therefore give this subject his undivided attention and prepare himself to meet this dangerous and insidious foe.

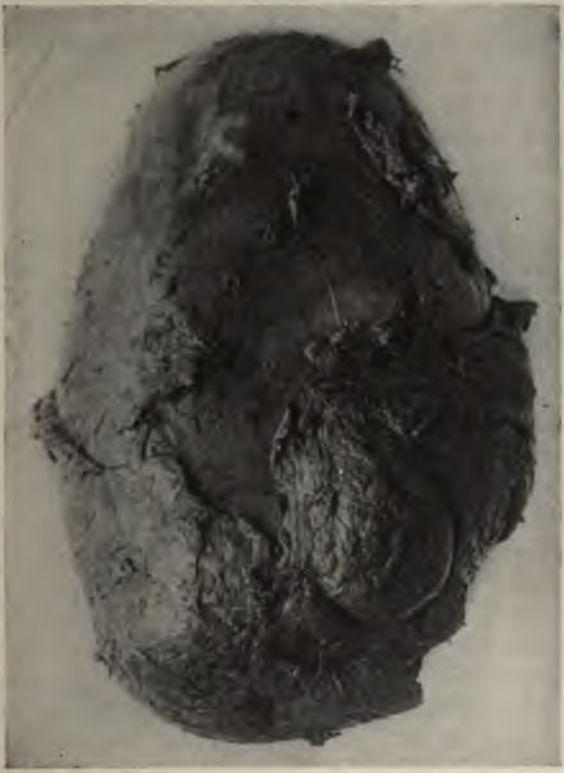
Hemorrhage may occur during pregnancy, during labor, or after labor. We have spoken of it in connection with abortion (p. 263).

Towards the end of pregnancy it is called *ante-partum hemorrhage*, and after the birth of the child it is known as *post-partum hemorrhage*. It may be due to a faulty implantation of the placenta,—*placenta prævia*,—to detachment of a placenta normally inserted, to rupture of the circular vein of the placenta, to atony of the uterus or inversion of this organ, or to laceration of the soft parts of the genital canal.

§ 1. **Placenta Prævia.**—Placenta prævia is the implantation of the placenta at the internal os. It may be divided into *complete*, or *central*, placenta prævia and *incomplete*, or *partial*, which again is subdivided into *marginal* placenta prævia and *lateral* placenta prævia. It is called central when it covers the whole internal os (Fig. 386); marginal if it only touches a part of the margin of the os, and lateral if it does not reach the internal os at all, the lowest limit of it being somewhere on the lower uterine segment.

Pathological Anatomy.—Frequently the placenta prævia, besides being abnormally inserted, is abnormal in shape and construction. Often it is membranous, horseshoe-shaped, or accompanied by placentæ succenturiatæ. On the atrophic portions of the placenta the villi of the chorion are covered only with connective tissue and not with decidua. Their interior is full of granules and fat drops and often it is the seat of thrombosis. This imperfect development of the placenta is probably due to the thinness of the decidua near the os internum compared with that higher up on the walls and the fundus.

FIG. 386.



Central placenta prævia. Half actual size. From a patient under the author's care. End of sixth month of pregnancy. Entire unruptured ovum expelled after tamponade continued for three days. No loss of blood. The placenta covers the whole back of the specimen and a little of the upper end, beside the whole lower end and nearly half of the front. Most of the placenta was inserted on the anterior surface of the uterus. The shortest distance from the os internum to the circumference of the placenta was two inches.

Etiology.—Much ingenuity has been expended, and in the writer's opinion wasted, in explaining the occurrence of placenta prævia. A chief theory is that the faulty insertion is due to an arrested abortion. The advocates of this theory think that the ovum originally is embedded higher up in the uterus and becomes detached and re-embedded over or near the os internum. But if we take into consideration that the whole unimpregnated uterine cavity is only 2½ inches (6.5 centimetres) deep, of which fully one-half belongs to the cervix, it seems to me easy to imagine that the ovum may not as usual become embedded at a short distance below the uterine ostium of the Fallopian tube and grow downward, chiefly spreading over the anterior or posterior wall, but is carried down by the movement of the cilia of the uterine epithelium and even by gravity, until it is so low that, when it grows, it extends to or even beyond the internal os. This theory of the primary low implantation of the ovum is corroborated by the clinical facts that placenta prævia becomes more and more common with repeated pregnancies and that uterine catarrh predisposes to it. By repeated pregnancies and endometritis the endometrium becomes abnormal. There is not the same perfect nidation, prepared to catch the ovum, retain it, and enclose it. It slides down on the hardened, glazed surface of the uterus.

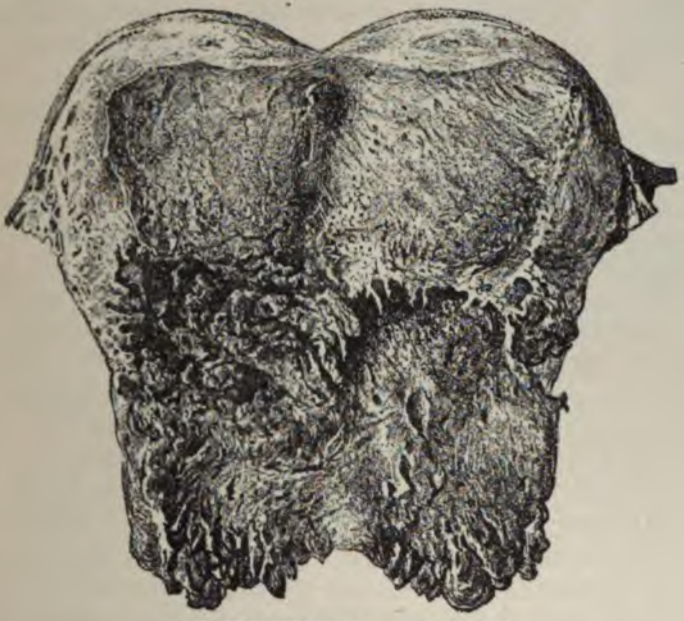
In many cases it is doubtless lost, being washed out with uterine secretions. That is why women rarely have more than four or five children, and why those who suffer from corporeal leucorrhœa rarely become impregnated. In other cases the ovum is arrested and finds a seat for development near the internal os. From this point it spreads upward and around the internal os, forming the horseshoe-shaped placenta; or it may extend across to the other side, as shown in the figure. In this case nidation probably had taken place on the posterior wall, to which the larger and thicker part of the placenta was found attached.

In exceptional cases the placenta may even extend into or through the cervix by tongue-shaped prolongations, reaching as far as the vaginal surface of the vaginal portion; or the whole cervix may be the seat of the placenta, as in Fig. 387. The cervix then becomes unusually thick and succulent, and the decidua is formed all the way down to the external os. In such cases I think the original implantation of the ovum occurred just at the internal os, but the growth extended only in the direction of the cervix (*cervical placenta prævia*).

Symptoms and Diagnosis.—The chief symptom of placenta prævia is the hemorrhage. Any hemorrhage occurring in the latter half of pregnancy must awaken the suspicion of placenta prævia. Generally, it is, however, only during the last three calendar months that bleeding begins, most commonly between the twenty-eighth and the thirty-sixth week, less frequently between the thirty-seventh and the fortieth week, and still less frequently at the normal end of pregnancy. Often pregnancy ends in abortion or premature labor.

Placenta prævia is met with once in about 573 labor cases. The hemorrhage comes on suddenly, often without known cause. In general the causes of it are the same as those which lead to hemorrhage from a normally implanted placenta, such as the rupture of a uteroplacental vessel at the internal os, rupture of the marginal sinus of the placenta, partial separation of the placenta from the uterine wall in consequence of jerks and falls or uterine contractions which, as we know, begin early in uterogestation (pp. 99 and 102). In many cases hemorrhage occurs only during labor or after the birth of the child. In rare cases nature itself conquers the dangers. The bag of waters is ruptured, the presenting part compresses the bleeding surface, acting like a tampon. Good labor-pains, causing a rapid delivery, favor this fortunate termination. But this event is so rare that it would be folly to expect it and await it. As a rule, the hemorrhage is so great that the patient deprived of the help of obstetric art loses her life. The hemorrhage that occurs during pregnancy may be quite moderate, but there is no telling when it will be repeated and with what strength it will reappear. A patient with placenta prævia is in constant danger of death. Often the hemorrhages occur at the time when menstru-

FIG. 387.



Cervical placenta prævia. (Von Weiss.)

ation would be due, doubtless on account of an active congestion taking place at those periods. The central form causes the worst hemorrhage. As a rule, the cervix and lower uterine segment are soft and yielding. The uterine expansion that occurs during the end of pregnancy may therefore take place without causing any hemorrhage, but when the internal os begins to open up, the lower pole of the ovum must of necessity separate from the uterine wall, and this cannot be done without tearing villi of the chorion, opening uterine sinuses, and sometimes tearing uterine arteries. If the hemorrhage begins after delivery, it is particularly dangerous. It is then due to atony of the placental site; and the best natural means of arresting uterine hemorrhage, muscular contraction, is deficient or absent.

The blood appears externally at the os uteri during contractions, and the contractions may, of course, sever vessels, and thus cause bleeding; but, on the other hand, contraction compresses torn vessels and prevents them from bleeding, and pushes the presenting part against the bleeding surface of the uterus, which it compresses like a tampon.

It has been noticed that if the placenta is expelled before the child, all bleeding ceases, which is due to this same mechanism of uterine contraction and pressure against the bleeding surface of the uterus.

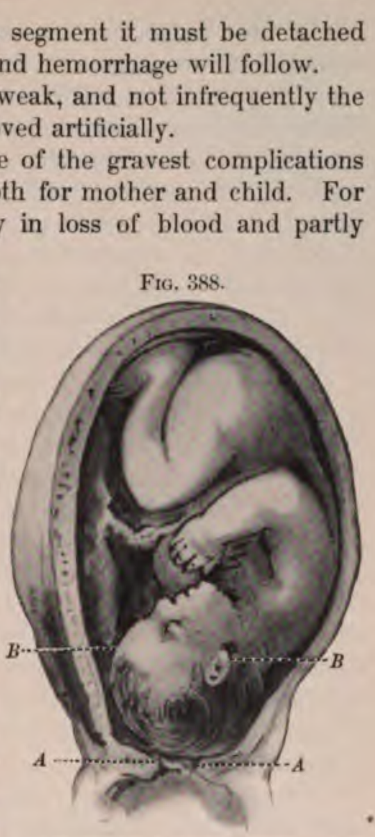
By vaginal examination the upper part of the vagina or one side of it presents a peculiar boggy sensation, due to the presence of the placenta in that locality.

If the cervical canal is open, a spongy, soft mass is felt, which can be distinguished from a mere blood-clot by not breaking down under pressure with the examining finger. The wall of the uterine cavity may be divided by two horizontal lines into three zones, the fundal zone, the middle zone, and the lower zone, composed of the cervical canal and the lower uterine segment. The fundal zone is the portion of the cavity situated above the uterine apertures of the Fallopian tubes. This is often, but erroneously, described as the normal seat of the placenta. It is true, the placenta may extend more or less over the fundus, but the bulk of it is inserted on the anterior or the posterior wall. The middle zone corresponds to most of the corpus of the uterus and extends down towards the line that marks the degree of dilatation of the external os necessary to let the head pass. To this extent the uterus must retract from the lower pole of the ovum, and if any part of the placenta is implanted here it must become detached from the uterine wall as far as this line. By marking the largest circumference of the fetal head and measuring the distance of this ring from the lowest point of the presenting head, we find that the distance from the external os to the ring of greatest dilatation is about 3 inches (8 centimetres). On the fundus and in the middle zone the placenta is entirely safe, but in the lower uterine segment it must be detached when labor opens up the internal os, and hemorrhage will follow.

The uterine contractions are often weak, and not infrequently the placenta is adherent and must be removed artificially.

Prognosis.—Placenta prævia is one of the gravest complications of labor. It is fraught with danger both for mother and child. For the mother the danger consists partly in loss of blood and partly in the exposure to infection by the manipulations necessary for the proper treatment of the case. The child's life is also endangered by loss of blood through the detached part of the placenta, but especially by interference with oxygenation of the blood, if a large portion of the placenta is detached. If the whole placenta is detached and expelled before the fœtus, it must of necessity die, unless it can be delivered from its prison in a very short time. Many children die on account of their lack of maturity. Formerly about half of the children succumbed. As to the mothers, the mortality used to be twenty-five or even thirty-three per cent., but by improved methods of treatment this has been brought down to a small percentage. Hofmeier lost only 1 in 46 mothers, and in Pinard's clinic infantile mortality has been reduced to 6.8 per cent.

FIG. 388.



Placenta descending to boundary-line of largest expansion of the external os. (R. Barnes.) The placenta is above the line and therefore safe. The space between *A A* and *B B* is the range of orificial expansion necessary to permit the passage of the head.

Treatment.—The dangers threatening the mother and the fœtus are so great that, as a general rule, we may say that the latter's life should not be considered, but everything done to save the former, unless, of course, we can save both. Still, if the fœtus has not reached the age of viability, we may try to continue pregnancy until this term is reached. If hemorrhage occurs before the end of the seventh month, the accoucheur should try the effect of absolute rest in bed, rectal suppositories containing pulvis opii gr. i (6 centigrammes), one every three hours, fluid extract of viburnum prunifolium, ʒi, internally every three hours, adrenalin, stypticin, and vaginal suppositories with tannic acid:

℞ Acid. tannici, ʒi;
Ol. theobromæ, ʒii.
M. et ft. suppositoria No. xii.

The diet should be cool and bland, and the bowels should be kept open with a saline aperient.

If the child is dead, it is also best to follow a similar course, as the placenta will atrophy, and the danger of bleeding during and after labor will be much lessened.

If the hemorrhage occurs after the child is viable, no attempt should be made to prolong pregnancy. The accoucheur should be guided by two purposes,—to stop the hemorrhage and to avoid injuring the mother. In most cases the cervix is soft and dilatable, but in others it is friable and tears easily. The mother's condition may be so low in consequence of loss of blood sustained before the arrival of the obstetrician that the first indication is to gain a little time and allow her to recuperate before beginning any operative manipulations. Under such circumstances, and if at the same time the os and the cervical canal are closed, the proper thing to do is to ***pack the vagina and vulva*** very tightly with creolin cotton (see OPERATIONS) and cover the genitals with two towels rolled so as to form hard cylinders and retained in place by a T-bandage with two tails crossed in front of the towels. For safety's sake the patient should, however, be watched all the time with regard to internal hemorrhage or blood soaking through the tampon. Concealed hemorrhage would betray itself by weakening of the pulse, pallor, yawning, and clamminess of the skin. If the tampon works well, it may be left in two or three hours, and, if necessary, renewed.

But if the patient's condition warrants it, and the cervix is dilatable, it is much better to abstain from the tamponade and begin *artificial dilatation* at once either by Harris's or Bonnaire's method. (See OPERATIONS.) If by this means the os externum can be dilated enough to pass one finger through the cervical canal, the placenta should be detached from the lower uterine segment as far as the finger can reach. By this method, first recommended by Robert Barnes, often all hemorrhage stops, and it will do so still more surely when the operation is repeated with two fingers, because this will detach the placenta from the whole lower uterine zone described above. If there is only room for one finger and the cervix does not readily yield, the smallest Barnes bag (see OPERATIONS) can be introduced, and when fully dilated replaced by the second size.

As soon as two fingers can be inserted, the fœtus should be ***turned*** and *one foot brought down*, by Braxton Hicks's method, which was particularly invented to combat placenta prævia, and which will be described in detail in speaking of obstetrical operations. When one leg is brought down and most of the liquor amnii has escaped, the thigh and the breech serve as a tampon compressing the surface of the uterus from which the placenta has been peeled off.

If it is a case of marginal or lateral placenta prævia, there is no difficulty in seizing the leg. If only a small part of the placenta covers the whole os, it may be possible to get at the membranes where the smallest flap is situated. But if the whole space as far as the obstetrician can reach is covered with placenta, the operator should lose no time in perforating it. This may be done with a long, curved artery-forceps or any other suitable blunt instrument, and the opening thus made dilated with the fingers.

Some recommend puncturing of the membranes or perforation of the placenta as soon as the uterus can be entered, as then the presenting part sinks down and presses against the bleeding surface; but it facilitates the podalic version to have unruptured membranes.

Though turning should be performed as early as it can be done without injuring the mother, *extraction should not follow.* When hemorrhage is under control by the compression exercised by the fœtus, we should give the cervix all the time needed for complete dilatation, which in Hofmeier's wonderfully successful series, alluded to above, proved to be from one-half hour to one and three-quarters hours. During this time it is well to give hypodermic injections of large doses of ergotine—as much as 6 grains (40 centigrammes)—or, probably better, to give by the mouth solution of adrenalin chloride or suprarenal liquid with chloretone, ♏v to xxx, or stypticin (gr. ½ to 1—from 3 to 6 centigrammes). (See below under POST-PARTUM HEMORRHAGE.)

In order to avoid the danger of air embolism, it is safer to do all manipulation with the patient in the dorsal position. When the uterus is empty, it should be irrigated with creoline emulsion (1 per cent.).

While Braxton Hicks's method did so much for the mother, it practically ignored the fœtus. A new era has therefore begun by the use of Champetier de Ribes's unyielding bag and the substitution of forceps delivery for version. (See OPERATIONS.) The membranes are not only ruptured, but torn to the greatest possible extent. If necessary, the placenta is also perforated and torn. Then the bag is introduced through the rent and filled with fluid. By direct pressure on the bleeding surface of the uterus it arrests hemorrhage. By pulling on it or by attaching weights to it by means of a rope going over a pulley at the foot of the bed, the pressure is kept up and dilatation of the cervix is accomplished. When the fully expanded bag passes, there is also room for the head and the forceps.

If there is any bleeding after delivery, the uterus and the vagina should be tamponed, the first with sterile gauze or iodoform gauze, the second with creoline cotton. Some of the topmost tampons might also be wrung out of chloride of iron solution (1 part of liquor ferri chloridi to 10 parts of water), which has still higher hæmostatic power.

If much blood has been lost, the anæmic condition of the patient demands attention during or after labor. If there is not fluid enough circulating through the heart, this organ gets out of order and the patient may die of heart failure. The chief indication is, therefore, to increase the amount of blood circulating through the body by means of injection of normal salt solution. (See OPERATIONS.)

The foot of the bed should be raised on a chair, so as to insure a steady blood-supply of the brain. The head should never be elevated above the level of the bed. The patient should be surrounded by half a dozen bottles or rubber bags filled with hot water. Great care should, however, be taken not to have the water so hot as to burn the patient. If the bottle is too hot, it should be wrapped up in a towel. Rubbing of the skin and kneading of the muscles of the extremities are useful in bettering the peripheral circulation. Strong spirit of ammonia held under the nose stimulates the nervous system.

Cæsarean section, both the conservative and Porro's operation, has been successfully performed in several cases. The latter is oftener indicated than the former. One of the great dangers in placenta prævia is the failure of the uterus to contract after being emptied. Hence new hemorrhage and often death. This lack of contraction also invites sepsis. By removing the uterus we cut off the source of hemorrhage and the soil for infection. But Porro's operation offers the mother by far not so good chances as the treatment by rupture of the ovum, compression, dilatation of the cervix, and forceps delivery. It should therefore be reserved for cases in which it is impossible to arrest hemorrhage in any other way, especially primiparæ with undilatable cervix and a narrow vagina. If the uterus contracts well after the removal of the child and the peeling off of the placenta, and all hemorrhage ceases, the uterus may be spared.

All those who have advocated Cæsarean section have compared the results obtained in conservative Cæsarean section and Porro's operation when performed by the greatest operative obstetricians with the old statistics of vaginal treatment of placenta prævia in promiscuous practice. By thus ignoring modern progress in the vaginal operation, their argument becomes unfounded on facts. Cæsarean section has been performed six times and Porro's operation twice. The maternal mortality has been three, or 37½ per cent., the infantile two, or 25 per cent. Even if the two cases are left out because recourse to the abdominal operation was had too late, there still remains one mother dead out of six, or 16⅔ per cent. maternal mortality. When this is compared with Hofmeier's and Pinard's maternal mortality of 2.1 and 2.6 per cent. respectively, and the latter's infantile mortality of only 6.8 per cent., Cæsarean section cannot be looked upon as an operation one should choose, except when forced to it. The saving of the children does not make up for the greater loss of the mothers.

Later, when the acute danger is passed, the patient should have as much albuminous food—meat, eggs, milk, and bread—as she can digest, extract of red bone marrow (ʒii–℥ss t. i. d), iron, manganese, arsenic, quinine, phosphorus preparations, strychnine, and terraline.

§ 2. **Premature Detachment of Normally Inserted Placenta.**—It is not only the placenta prævia that may cause ante-partum hemorrhage. Also from the normally implanted placenta there may be loss of blood due to a premature partial detachment. The hemorrhage may be external or internal (concealed), or combined internal and external.

The detachment may not implicate the border of the placenta. In that case there forms only a more or less large blood-clot between the placenta and the uterus, and there is no external hemorrhage. In other cases the blood may detach part of the margin of the placenta; the blood peels the membranes from the uterine wall, and may then appear outside. But if the lower segment of the uterus hugs the presenting part closely, it is also possible that the detachment is arrested there. Under such circumstances there may be a very considerable loss of blood, although none shows outside. In other cases, again, a small part of the extravasated blood may find its way out, while by far the larger portion is retained in the body of the patient. The blood rarely ruptures the membranes and enters the interior of the ovum. The liquor amnii being under the same even pressure as the extravasated blood resists its entrance, until the membranes are ruptured at the lower pole of the ovum and the liquor amnii escapes. A considerable amount of blood may also fill the fundal region of the uterus.

This premature detachment of the placenta may take place during the latter months of pregnancy, when the extravasated blood will cause irritation and bring on labor; or it may occur after labor has begun.

Etiology.—The predisposing cause of the detachment is a diseased condition of the villi of the chorion or of the decidua serotina, which often is found in a state of inflammation. This condition is in most cases allied to nephritis or to the presence of a kidney of pregnancy. Acute infectious diseases are frequently the cause. It has also been found in connection with exophthalmic goitre (Graves's disease). A deep seat of the placenta seems to predispose to the detachment.

Women who have borne many children are more inclined to this accident than primiparæ, which, doubtless, is due to an inferior condition of the endometrium. General weakness and anæmia are also predisposing factors. Sometimes injury is the direct cause of the detachment, such as a fall, a kick, or similar violence, or undue exertion on the part of the patient in lifting heavy weights. Violent uterine contraction may prematurely diminish the size of the placental site so much that the placenta is loosened from its base. During labor the detachment may be due to a sudden diminution of the size of the uterus, such as happens in hydramnion, or after the birth of the first child in twin pregnancies.

Symptoms.—If there is no external hemorrhage to call attention to the concealed hemorrhage, other symptoms become so much more important. The patient experiences a sudden abdominal pain. The uterus may become much enlarged, or it may assume an irregular shape. There is a sudden collapse, the patient gasps for air, and her skin becomes pale, cold, and clammy. Uterine contractions are weak or absent altogether. There may be circumscribed tenderness of portions of the uterus. Since the fœtus soon dies, fetal movements cease. If there is an external discharge of blood, or at least of bloody serum, that corroborates the diagnosis. In rare cases the placenta, as in placenta prævia, may be wholly detached and expelled ahead of the child, so-called *prolapse of the placenta.*

Diagnosis.—Premature detachment of the normally inserted placenta can hardly be confounded with anything else than common syncope or rupture of the uterus. In *syncope* all the local changes are absent. In *rupture of the uterus* the presenting part recedes and enters the abdominal cavity, where it may be felt. The uterus becomes contracted and diminished in size, while in placental detachment there are weak contractions or none and a distention of the uterine cavity.

Prognosis.—The prognosis is bad for both mother and child. In 106 cases collected by the late Dr. William Goodell, of Philadelphia, out of 107 children only 6 survived, and of the mothers 54 were lost. The external hemorrhage is less dangerous than the concealed, since with the former, as a rule, some uterine contraction will set in and moderate the loss of blood.

Treatment.—The first step is to rupture the membranes, so as to diminish the uterine cavity. The next indication is to empty the uterus as soon as possible. If the head is engaged, this may be done by applying the forceps; but in most cases podalic version must be performed, which, in this case, unlike placenta prævia, should be followed immediately by extraction of the child and removal of the placenta.

If the os is not dilated, the accoucheur should try to open it by Harris's or Bonnaire's method, or, if the upper part of the cervix is dilated and the os resists dilatation, two to four deep incisions should be made in the cervix up to the vaginal roof. If they bleed after the removal of fœtus and placenta, they should be closed with sutures.

After version is performed or during the application of the obstetric forceps, full doses of ergot, adrenalin, or stypticin should be given.

If the patient when first seen is very much affected by pain and loss of blood, it may be necessary to stimulate her with strychnine, nitroglycerin, digitalis, or alcohol before exposing her to the shock of operative interference; but the obstetrician must bear in mind that the most important means of saving the patient is to empty the uterus and cause the uterus to contract well by kneading it, injection of hot water, alcohol, vinegar, undiluted tincture of iodine, or the application of a faradic current of electricity. If the bleeding still continues, the cavity should be injected with liquor ferri chloridi, diluted with ten parts of water, or ferripyrine in a similar solution.

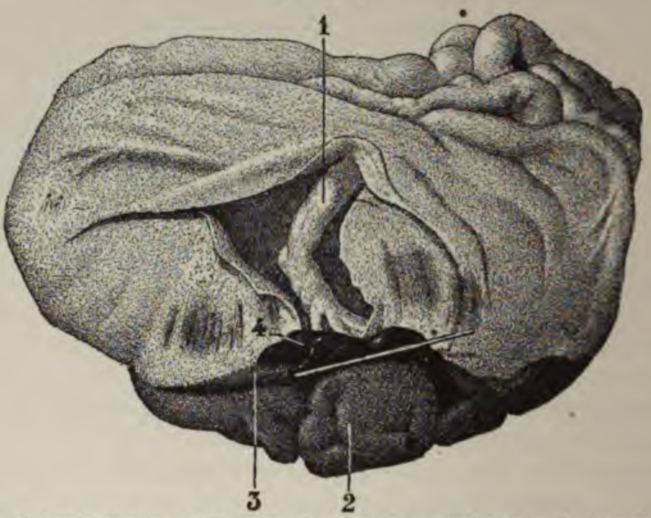
§ 3. **Rupture of the Circular Sinus of the Placenta.**—The circular sinus forms a more or less complete venous vessel in the circumference of the placenta. It belongs to the maternal part of the placenta. It is formed by the fusion of five or six large venous sinuses, and is somewhat uneven in calibre, one part being more voluminous than another. It may form a complete circle or be interrupted in places. When distended with blood, it may swell to the size of a little finger. On the cut surface it shows a triangular lumen. One side is in contact with the decidua, another with the chorion, and the third is full of openings, like a sieve, leading into the sinuses between the cotyledons. It plays the *rôle* of a reservoir in which the surplus of blood finds room when pressed out of the placenta.

Etiology.—This circular sinus may rupture on account of too great internal pressure, so much more so as some parts of its course are narrower than others. Or it may be torn when the rupture in the membranes extends to it. This accident is most commonly combined with placenta prævia or the premature detachment of a normally situated placenta, and is then apt to be overlooked. But the rupture of the sinus may also occur as the only source of hemorrhage (Fig. 389). It may arise during pregnancy or during labor. A diseased condition of the decidua renders the wall weaker, and thus facilitates rupture. Any physical injury, an over-exertion, or uterine contractions during labor may furnish the exciting cause.

Symptoms and Diagnosis.—As a rule, the placenta is in cases of rupture of the circular sinus situated low down in the uterus. The blood therefore finds an easy outlet through the os. There is no distention of the uterus, and no pain as in *detachment of the normally inserted placenta.* Since the blood is not retained in the interior of the uterus, it has a bright red color. As a rule, the loss of blood is moderate, but the hemorrhage may become dangerous by its steadiness. There is not that sudden collapse as in detachment of the placenta, and the physical signs of *placenta prævia* are absent. When the afterbirth is examined a small round opening or a tear will be found in the sinus, and often a blood-clot extending in its interior and plugging the aperture.

Prognosis.—The prognosis for the mother is better than in placenta prævia and in premature detachment of the normally inserted placenta. The hemorrhage generally stops spontaneously by the formation of a blood-clot. The hemorrhage is visible and not very abundant. For the fœtus the prognosis is less good, since it may die from asphyxia, or has to be sacrificed in order to save the mother.

FIG. 389.



Rupture of the circular sinus of the placenta. (Budin.) 1, umbilical cord; 2, cotyledons; 3, circular sinus; 4, blood-clot.

Treatment.—If the fœtus is not yet viable, we should try, if possible, to postpone delivery. Rest in bed, opiates, viburnum prunifolium, vaginal suppositories, with tannin or pledgets dipped in diluted liquor ferri chloridi in the upper part of the vagina, should be tried. Hot injections and tamponade are too apt to induce labor, and can therefore not be recommended as long as there is hope of postponing it. But if the hemorrhage continues the uterus must be emptied; and then tamponade is the best preparatory step, since it at the same time arrests hemorrhage.

If the fœtus is viable the membranes should be ruptured at once, and if the hemorrhage does not stop labor should be furthered by the means enumerated above.

§ 4. **Rupture of Umbilical Vessels in Velamentous Insertion.**—If the umbilical vessels spread over that portion of the ovum which has to be torn to let the child pass, they may be ruptured and give rise to hemorrhage; or they may be compressed between the presenting part and the pelvic brim. In both cases the child is in great danger either from loss of blood or from asphyxia.

Diagnosis.—This condition may be diagnosticated if one feels a pulsating vessel traversing the bag of waters.

Treatment.—The rupture of the membranes should be postponed till the os is wide enough to end labor. For this purpose a colpeurynter is placed in the vagina and moderately distended so as to furnish equal counter-pressure to the pressure under which the liquor amnii is from within.

When the os is sufficiently dilated, the child should be extracted by forceps or version.

§ 5. **Post-partum Hemorrhage.**—After the birth of the child, hemorrhage may be *primary* or *secondary.* Primary hemorrhage may occur before or immediately after the expulsion of the placenta. econdary hemorrhage may set in after an interval extending from ours to weeks. The primary hemorrhage may be due to lack of terine contraction or to injuries sustained by the soft parts—lacerations of the cervix, the vagina, or the vulva. Of these two categories that produced by atony, or inertia of the uterine musculature, is by far the more dangerous.

We know that the uterine veins become much enlarged during regnancy, and form large spaces, so-called sinuses. These are embedded in the depth of the muscular coat of the uterus, each fibre f which, as we know, becomes enormously hypertrophied during regnancy, and which forms three powerful layers compressing the terus in all directions (p. [illegible]). In the absence of contraction the inuses form large tubes with oval-shaped lumina, but during contraction they are compressed to flat lines, as seen in Fig. 118.

In normal labor the contractions press the walls of the sinuses gainst each other till they agglutinate and partially become impermeable, or where they open on the free surface, at the placental site they are compressed long enough to give time for the blood to coagulate in their interior. Under these normal conditions the loss of lood during and after the third stage of labor is, therefore, moderate, nd harmless. But if this harmony is disturbed, if the uterus does not ontract, the blood may pour out of the placental canal in a [illegible] nd the patient succumb in a few [illegible]. These extreme cases [illegible] however, rare; but more or less serious post-partum hemorrhage is by no means infrequent.

Etiology.—This accident is comparatively common among women of the higher classes, who lead a life of leisure, have little developed muscles and an over-sensitive nervous system. Sickly or anæmic women, who have a poor constitution, are more liable to uterine inertia than their healthier and more robust sisters. The event is observed more frequently in hot climates, at least in women who are not acclimated. It is described as a positive danger in store for English women sojourning in East India, and a similar experience may be expected when American women follow our armies to the newly-acquired possessions in the tropical regions of the Atlantic and the Pacific.

Anything that causes defective uterine contraction is apt to lead to post-partum hemorrhage. Multiparous women are more exposed than others, doubtless on account of a deterioration of the uterine muscle-fibres. Previous hard labors seem especially to predispose the patient to post-partum hemorrhage. There may be an original weakness of the musculature, which is particularly found in bicornute uteri. The contractive force may be exhausted by a protracted labor. Great distention of the uterus, as in hydramnion or in twin pregnancies, predisposes to it. Likewise sudden evacuation of the uterus, as in precipitate labor, rapid forceps delivery, or extraction after version. Retention or adhesion of the placenta or membranes, especially of placentæ succenturiatæ, is a frequent cause of hemorrhage. Improper treatment of the third stage of labor may directly induce it. Not only the old-fashioned pulling on the umbilical cord is objectionable; but even the expression method, if used before there is a spontaneous contraction of the uterus, is likely to loosen parts of the placenta from the uterine wall while the more intimately connected portions remain adherent. A distended bladder or loaded bowel may also interfere with uterine contraction and cause hemorrhage. In a pendulous abdomen the uterus is not properly supported and abdominal pressure is weak. The use of chloroform in large quantity weakens the uterine contractions and is a frequent cause of post-partum hemorrhage.

Uterine contraction may be irregular, so that one part of the uterus is more contracted than another. Thus we have seen above (p. 360) that there may be a tetanic contraction at the contraction ring, which may cause retention of the placenta. Sometimes the placental site remains lax—so-called *paralysis of the placental site*—while the surrounding tissue contracts, the result being that that part of the uterus where the serotina was inserted bulges inward into the uterine cavity and may become the starting-point of inversion.

Some women seem to have a peculiar predisposition to flooding, perhaps due to hæmophilia.

Symptoms.—Great loss of blood has a terrible effect on the patient. She turns pale; her skin becomes cold; perspiration pearls out on it; she sighs, yawns, and gasps for air. Restlessly she tosses about on her bed and throws up her arms. The pulse becomes thready or insensible. The patient complains of faintness or may become unconscious. She may become blind. Convulsions may break out, and death may finish the scene.

If the hemorrhage is not so profuse, the uterus may alternately contract and relax. From time to time large clots followed by fluid blood are expelled.

After severe loss of blood, the patient long remains weak and anæmic. It may take months and even years before she quite recovers.

Diagnosis.—A point of great practical importance, and which must be settled at once, is whether the source of the hemorrhage is the interior of the uterus—that is, the placental site—or some tear in the cervix, the vagina, or the vulva, especially the perineum. This question is promptly answered by palpating the womb. If it is small, hard, and well-contracted, the body of the uterus may be excluded, and we may search for injuries. By spreading open the vulva we see the perineal body and a part of the vagina. With the finger we may feel tears higher up in the same or in the cervix. By turning the patient on her left side and introducing Sims's speculum and retractors the spurting vessel may be seen and made accessible to treatment.

Another distinctive point is the character of the hemorrhage. If the source is an injury to the soft parts, the flow is much less; it is steady, the blood has a bright red color, it is fluid; while in intrauterine hemorrhage the loss of blood is much larger, the flow is, as a rule, interrupted, the color is darker, and from time to time clots are expelled.

If we feel the uterus large, soft, and flabby, the blood comes from the interior, and no time should be lost in looking for other sources, which may be attended to later, whereas the uterine hemorrhage is an urgent indication for immediate therapeutic action.

Treatment.—The treatment is partly prophylactic, partly curative. Much can be done to prevent post-partum hemorrhage, and it may even be said that with proper management of labor the event is rare and may never be seen in its higher degrees. From the moment the child is born till at least half an hour after the placenta is delivered, the fundus of the uterus should be held without interruption by the hand of the obstetrician or the nurse. When it is properly contracted, nothing more should be done. But the moment it is felt to soften, the abdominal wall should be moved gently from side to side and from the front to the back and *vice versa.* In this way a mild tickling of the peritoneal surface of the fundus is produced, which may be all that is needed to call forth renewed powerful contractions. If that does not suffice, the womb may be kneaded and squeezed with the same hand.

The pulse gives sometimes a warning of impending danger. In normal deliveries it drops to 70 or 60 beats in a minute. If it ranges from 100 to 120 the obstetrician should be particularly watchful, and should under no circumstance leave the patient.

The rectum should always be emptied before labor. A full bladder should be evacuated with the catheter, unless the patient can micturate.

If the hemorrhage is not serious, the uterus need not be entered. It suffices to compress the fundus. As soon as there are contractions, the accoucheur should try to press the placenta out by Credé's method. Blood-clots are likewise pressed out from above or helped out by introducing one finger into the os. But if this does not arrest the hemorrhage, the well-disinfected hand should be introduced and the placenta removed as described above (p. 419).

The aorta can easily be felt and compressed against the vertebral column a little above the promontory. This procedure does not shut off the blood supply of the uterus, since there comes as much blood through the ovarian artery as through the uterine; but it diminishes the supply by one-half, and once located, the artery may be compressed by an unskilled assistant, while the doctor is otherwise engaged in the interest of the patient.

The uterus itself may be powerfully compressed by pushing two fingers up in the posterior vault of the vagina, against the posterior wall of the uterus, and forcing the fundus down with the other hand. Sometimes the compression can be made even more effectual by placing the inner fingers against the anterior vault so as to reach the anterior wall of the anteflexed uterus.

Both the extremes of temperature are exciters of uterine contraction; but there is this difference, that a low temperature weakens the patient, who is already cold and exhausted by loss of blood, while a high temperature is a powerful restorative. Cold should therefore be applied only in a transient way. A towel may be wrung out of ice water and used for slapping the lower part of the abdomen in front of the uterus. Heat may be applied in the shape of intra-uterine injection of hot water (110–115° or even 120° F.). Although this is very painful, the patient must stand it. There is no time for administering an anæsthetic, and, besides, it is too dangerous.

All the remedial resources so far considered aim at the establishment or strengthening of uterine contraction, a physiological act which will in the vast majority of cases result in arrest of the hemorrhage.

If, however, the flow continues, another class of remedies is at our disposal, those which chiefly act in a chemical way, by causing the blood to coagulate. Instead of using plain hot water, the writer employs an emulsion of creolin (one per cent.), which is both astringent and antiseptic. An ounce of undiluted tincture of iodine was injected to great advantage by Dupierris, a physician practising in the West Indies, and his example has been followed by many others. The tincture certainly coagulates blood, and is one of the best antiseptics, and the coagula formed are not so hard as those produced by iron salts.

The late Dr. R. A. F. Penrose, of Philadelphia, praised in the highest terms common vinegar, both as an irritant and as an astringent. He recommended to pour a few tablespoonfuls of vinegar out nto a vessel, dip a clean rag or pocket-handkerchief into it, carry it with the hand into the cavity of the uterus, and squeeze it. If necesary, this procedure is repeated two or three times. This sounds ather antiquated in our days, when we hear only of aseptic gauze, erilized fluids, and disinfected hands. But I can easily imagine sitations in which this old remedy may be the best available and may ave lives that otherwise would be lost. Advices that are admirable lying-in hospitals and may be followed to advantage in wealthy rivate practice, where every possible event has been anticipated and rovisions made to meet it, may not be practicable under all circumances. Let us, for instance, take the case of a physician called in a urry by a midwife, whose patient is bleeding to death. Under such rcumstances it would be folly to abstain from acting because of the mote danger of infection. The present danger of collapse and eath from loss of blood is the issue to be met, and perhaps it is well hen to think of the old time-honored vinegar, which is found in every welling, can be applied without apparatus, excites the uterus to conraction, coagulates albumen, and even has antiseptic properties.

I purposely keep the liquor ferri chloridi for the last. I carry it lways in my satchel, but I do not think that I have ever used it in n obstetric case. It is a most powerful styptic, and by the chlorine contains it has also antiseptic value; but the coagula produced by it re hard and slow to disintegrate, and before their removal they are pt to become infected. I look, therefore, upon this remedy as a last esort, to be used only when everything else fails. It may be used as ntra-uterine injection diluted with from six to ten parts of water or queezed out undiluted from a pad carried up to the fundus. After aving used a styptic, the uterus should no longer be compressed, as he compression might lead to the detachment of a thrombus, and hus start the bleeding again.

Of late the extract of the suprarenal capsule has been much raised for any kind of hemorrhage. It is said both to be astringent and to cause uterine contraction. Dr. James B. Moore dissolved ʒiii of Armour's pulverized extract in ℥viii of water and filtered it through sterile gauze. In this he dipped a strip of gauze three-fourths of an inch (two centimetres) wide and one and one-half yards long, and packed it all into the uterus, removed it shortly after, and washed out with sterile water. Simultaneously he gave gr. x of the extract by the mouth. The hæmostatic effect of the drug when used locally or internally is said to occur in less than a minute.[1] Parke, Davis & Co. have two preparations,—solution adrenalin chloride 1 : 1000, and suprarenal liquid with chloretone,—either of which may be administered internally in doses of ♏v–xxx.

Stypticin given internally in doses of gr. ½–1 (from 3 to 6 centigrammes) or hypodermically, dissolved in water, in doses of gr. ⅙–⅓ (1–2 centigrammes) and repeated according to circumstances is also a valuable hæmostatic. It is said also to be analgesic.

If an electric battery is available, it should be used at an early date. Either the faradic current or the interrupted battery current may be applied to great advantage. One pole should be placed at the fundus and the other alternately at either side of the cervix through the abdominal wall, where it will reach the large cervical ganglion that is in connection with most of the nerves supplying the uterine muscle bundles. It is probably the most powerful exciter of uterine contractions. As soon as the uterus is empty, some preparation of ergot should be given hypodermically.

Besides these measures directly aiming at uterine contraction and coagulation of the blood in the veins of the placental site, there are others which may be attended to simultaneously. The windows should be opened; the patient should be fanned. If pure oxygen is available, it should be administered. The foot end of the bed should be raised, with a view to causing the blood in the body to gravitate towards the brain. All four extremities may be wrapped up in roller bandages, beginning from the distal end and ending with circular compression of the arms and legs near the axillæ and the groins. By this means—so-called *auto-infusion*—the blood is concentrated around the vital organs,—the heart, the lungs, and the brain.

Transfusion of defibrinated blood from another individual is effective, but takes much time and is not easily obtained. Much simpler is the intravenous or subcutaneous injection of normal salt solution. (See OPERATIONS.)

Strychnine, nitroglycerin, digitalis, or atropine should be injected hypodermically as stimulants for heart and lungs. Strong spirits of ammonia should be held near the nostrils. Camphorated oil may be injected into the muscles.

---

[1] J. B. Moore, private communication; W. H. Bates, N. Y. Med. Record, February 9, 1901, vol. lix., No. 6, p. 207; E. A. Shafer, British Medical Journal, April 27, 1901.

When the imminent danger is passed, the patient should be watched, and the injection of normal salt solution or the administration of the above-mentioned drugs should be repeated until all danger is passed.

After emptying the uterus, it has been recommended to pack it and the vagina with iodoform gauze. So large a quantity may be needed for this purpose that it may not be without danger from the poisonous quality of the iodoform, which would be obviated by taking sterilized gauze. The method has met with favor, but seems to be inferior to the other methods recommended above. It is more rational and more in harmony with nature's own methods to rely on contraction and coagulation without leaving any foreign body in the uterus. Tamponing is in most cases surperfluous. It is not reliable, and it contains an element of danger as to sepsis. At all events, this method should be reserved for cases where the hemorrhage resists all other treatment, and then I take it to be better to soak some of the gauze in diluted liquor ferri chloridi.

Hemorrhage is often followed by a stage of nervous excitement. When reaction sets in, the patient may suffer from intense throbbing headache, great intolerance of light and noise, or general prostration. The best remedy for these troubles is opium.

When the acute danger is over, attention should be directed to proper alimentation and compensation for loss of blood. The food should be nitrogenous,—milk, meat-juice, and eggs; later, oysters, boiled sweet-bread, and, finally, poultry, ham, and meat. At this stage burgundy or port wine may also be useful, while, as long as there is any tendency to bleeding, alcohol, by increasing the inclination thereto, does harm and should not be given, except in the form of whiskey or brandy as a stimulant to combat threatening collapse.

Regarding drugs, the extract of red bone marrow (carnogen, hæmaboloids) is the most effective rebuilder of blood that I know of. The peptonoid of iron and manganese (among the imported preparations Gude's and Diettrich's, among the domestic feralboids) is claimed to be more assimilable than other chalybeates. The author has, however, seen excellent effect of—

℞ Solution ferrous malate (Amer. Pharm. Mfg. Co.)
(or Tinctura ferri pomata of the German Pharmacopœia),
Tinct. cinchonæ co., āā part. æq.—M.
Sig.—A teaspoonful three times a day after meals.

With the drugs named may also to advantage be combined arsenic, phosphorus, cod-liver oil, terraline, and other tissue builders.

Secondary Hemorrhage.—Hemorrhage may recur within a few hours of the primary one, and may then be looked upon as a continuation of the same; but it may also appear weeks and even months after delivery.

It may be brought on by a sudden mental emotion, pleasant or unpleasant. It may appear when the patient suddenly rises to the erect posture or strains herself in any muscular effort. Abuse of alcoholic drinks is very apt to lead to it. It may be due to sexual intercourse. Albuminuria or malaria may give rise to it. Sometimes the cause is retention of a piece of the placenta or of the membranes, or retroflexion of the uterus.

Treatment.—The treatment differs according to the amount of blood lost and the cause of the trouble. A retroflexed uterus should be replaced and kept up with a large pessary during the period of involution, at the end of which it is advisable to fasten the organ in the right position by some suitable operation.[1] If any part of the ovum is retained, it is removed by curettage.[2] If there is reason to believe the hemorrhage is of malarial origin, quinine and arsenic are indicated; and, if possible, the patient should change her residence, at least temporarily. Albuminuria demands proper treatment of the kidneys. The bowels must be kept open. The fluid extract of ergot should be given. The writer has also seen good effect of a decoction of cotton-root bark:

℞ Gossypii radicis corticis raspati, ℥iv.

Sig.—Boil 3 heaping teaspoonfuls with 1 pint of water for 15 minutes; strain. Drink one-third, cold, three times a day.

Some praise tinctura cannabis indicæ. Plain hot vaginal douches are useful and may be strengthened by the addition of liquor ferri chloridi (ʒss to Oi). Tannin pessaries may also be left in the vagina. A blister on the sacrum is said to have a good effect. If the hemorrhage is considerable and does not yield to these remedies, the vagina should be tamponed, and counter-pressure exercised over the lower part of the abdomen.

§ 6. **Inversion of the Uterus.**—Inversion consists in the turning inside out of the uterus. It is said to be so rare that only one case was observed in 200,000 cases of confinement in the Rotunda of Dublin. I am inclined to think that this is due to the superior method in which normal labor has been conducted of old in that institution. Having personally seen at least three cases, I cannot believe that the accident should be one of so extreme rarity, and most authors speak of it in terms of familiarity. Still it is undoubtedly rare, and has become much rarer since the management of normal labor has been improved, particularly since pulling on the umbilical cord has given way to expression of the placenta.

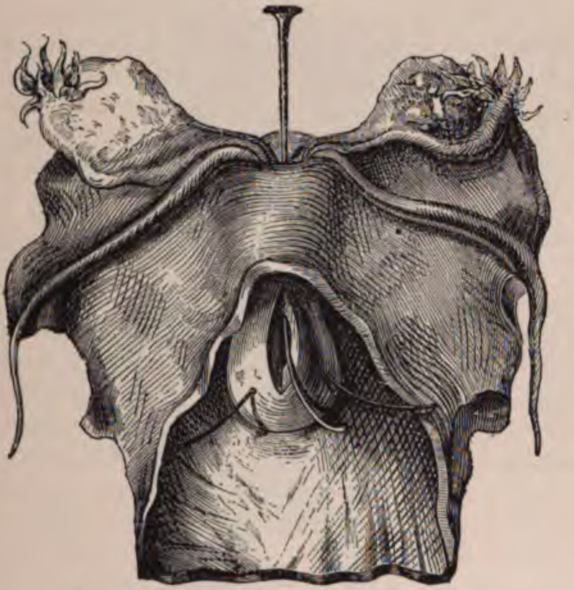
---

[1] Garrigues, Diseases of Women, third ed., pp. 471, 474–478.

[2] Ibid., p. 180.

Three degrees of inversion may be distinguished. In the first there is a mere indentation of the fundus, a bulging inward. In the second degree (Fig. 390) the partially inverted uterus forms a tumor in the vagina. In the third degree the inversion is complete (Fig. 391), the whole uterus, inclusive of the cervix, being turned inside out and forming a tumor outside of the vulva.

FIG. 390.

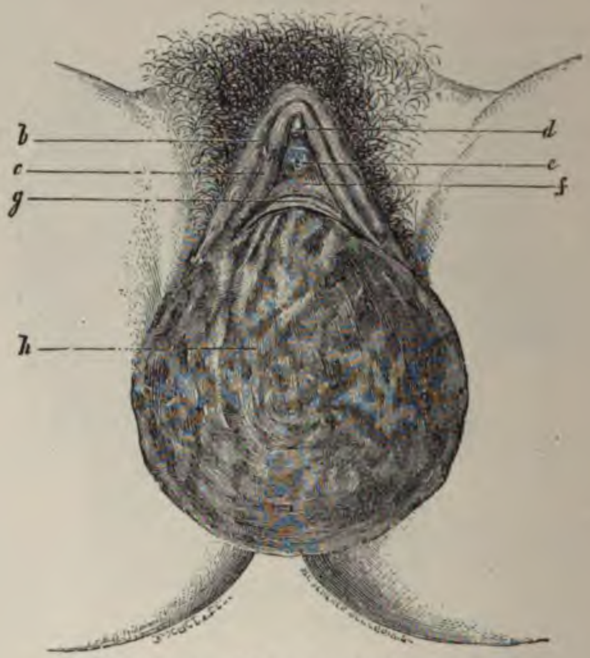


Incomplete inversion of the uterus. (Denucé.)

Etiology.—The inversion may be produced artificially through improper management, or arise spontaneously. Under all circumstances it can only happen when the placenta is not implanted, as it normally is, on the walls of the body, but on the fundus. Formerly the placenta was removed by winding the cord around the fingers of one hand, and often by pressing simultaneously on the placenta in the neighborhood of the cord. If we suppose the placenta to be somewhat adherent and the uterus not to be well contracted, we can easily imagine that the fundus might follow the traction exercised on it from below and become inverted. This movement would be seconded if, instead of grasping the whole upper part of the uterus, mere flat pressure were exercised on its top. Even the expression method, if not used properly, may favor it. Thus, if the accoucheur is in too great a hurry about expressing the placenta, and does it in the absence of a spontaneous contraction, he may push the fundus in.

But there is no doubt that inversion may occur without any fault of the obstetrician, the midwife, or the patient herself. In the first place, the accident is apt to occur in cases of precipitate labor, where nobody touches the womb. In such cases it is the child dangling between the legs of the mother which pulls on the cord, and, if this does not tear or the placenta become detached, the fundus may be pulled down through the contraction ring. Secondly, there are numerous observations in which the mechanism could be distinctly felt to consist in the relaxation of the central part, corresponding to the placental site, and strong contraction of the surrounding tissue, so that the lax part sank inward, was seized, and was, so to say, sucked down by the contracting part.

FIG. 391.



Complete inversion of the uterus. (Boivin and Dugès.)

Inversion has been observed also as a post-mortem occurrence, the gases developed in the abdominal cavity having expansive power enough to turn the uterus inside out.

Symptoms.—The inversion is often accompanied by a sudden, sharp pain in the abdomen, but the chief symptom is a post-partum hemorrhage that may assume such proportions that the patient faints, goes into convulsions, or even dies.

Diagnosis.—By placing the hand on the womb, it is found bulging inward, or the whole ball formed by the organ in normal delivery may be absent. A red, globular, bleeding tumor, covered with mucous membrane, may be seen protruding from the genitals; or it may be felt with one finger in the vagina or in the uterus; or if the whole hand is passed into the cavity, one may feel the fundus bulging downward.

The only thing inversion may be confounded with is a uterine *polypus*, but the differential diagnosis is easily made with a uterine sound, which passes a polypus and ascends to the fundus, while in inversion it is soon arrested by the invaginated uterus. In a case of *hollow polypus* the sound does not enter the uterus either, but the tumor contains fluid, is softer than the inverted uterus, and is an exceedingly rare affection, that by its nature is excluded from a puerperal case.[1]

Prognosis.—Inversion is a very dangerous condition, which may end fatally.

Treatment.—As soon as the diagnosis is made, the uterus should be replaced, which is much easier in the beginning than later.

If the uterus is only indented, the hand must be introduced and the closed fist used to push back the incurved portion of the womb. If true invagination is already accomplished, the fingers of one hand should be inserted through the abdominal wall into the funnel-shaped depression formed by the inverted uterus, and excentric pressure should be exercised on the ring encircling the invaginated portion, while the accoucheur tries to replace the prolapsed portion with the other hand. If he should simply press on the most prominent portion of the tumor in the hope of reinverting it, he would probably meet with insuperable resistance, for by so doing he would create a new invagination inside of the other and going in the opposite direction. He has better chances if he tries to replace the uterus, like the intestine in a hernia, by pressing on the part that has come out last and trying to replace that first and then the next highest portion, and last of all the fundus (McClintock's method). But the best of all methods is based upon the known anatomical distribution of the fibres of the inner layer of the muscular coat of the uterus (Fig. 121, p. 89). By pressing exclusively on the uterine opening of one of the Fallopian tubes, while counter-pressure is exercised from above, this horn may be reinverted, thereafter the other, and finally the remainder of the uterus (Noeggerath's method).

---

[1] Garrigues, Diseases of Women, third ed., p. 488.

When the uterus is replaced it should be manipulated with both hands, so as to bring it into a condition of strong contraction, which should be followed by a hot antiseptic intra-uterine injection, and, if needed, even a styptic injection. Besides replacing and kneading the organ, the accoucheur should use the remedies described in treating of post-partum hemorrhage.

The question presents itself how to deal with the placenta, if that is still attached to the inverted wall of the uterus. Here the obstetrician finds himself between the two horns of a dilemma. By removing the placenta he will diminish the surface to be replaced, but in peeling it off he may increase the hemorrhage. If the placenta is partially detached, it is best to detach it altogether before attempting reinvagination. If, on the other hand, it is still adherent all over, it is best to leave it undisturbed and try to push it back together with the inverted portion into the interior of the uterus. But if the accoucheur does not succeed in his attempt, he should try the other way and remove it first.

If reposition proves impossible, a colpeurynter filled with ice-water should be placed in the vagina. This will arrest hemorrhage, and sometimes at the end of some hours it may be possible to replace the uterus. Before giving up the case, the obstetrician should try Courty's method, in which two fingers of the left hand are introduced into the rectum, and attempt to open the constricting ring, while the fingers of the right hand are made to press on the base of the tumor; and even the method of Tate, of Cincinnati, who dilates the urethra until he can introduce the right index-finger into the bladder and press on the ring from this side, while the left index-finger and middle finger are used as in Courty's method and the thumbs press on the tumor.

Whatever method is chosen, the operation is much facilitated by anæsthetizing the patient, whereby not only the element of pain is excluded, but the uterus is relaxed. The only contra-indication is if the patient is in such a condition of exhaustion in consequence of loss of blood that the use of an anæsthetic becomes too hazardous.

If the case is not seen before days or weeks have elapsed since the accident occurred, reposition may still be tried, but then the prospect of its being successful is much smaller than immediately after delivery. If it does not succeed, protracted elastic pressure should be used, as for incarcerated retroflexed uterus (p. 299). If there is any bleeding, it should be checked by tamponade, which at the same time prepares the uterus for reinvagination. After the lying-in period, the case passes into the domain of gynæcology, and may, as a rule, be successfully treated by operation.[1]

[1] Garrigues, Diseases of Women, third ed., p. 490.

§ 7. Thrombus, or Hæmatoma, of the Vulva and the Vagina.—A thrombus, or hæmatoma, is an extravasation of blood into the connective tissue of the parturient canal. It may be *deep*, or *interstitial*, or *superficial* and *pedunculated*. The interstitial hæmatoma is most commonly situated in the labia majora of the vulva, more rarely around the vagina, and least frequently on the wall of the upper part of the pelvis. The seat and extension of the hæmatoma depend upon the source of the extravasated blood. If this is situated below the pelvic fascia, the blood accumulates in one labium majus, but may extend to the perineum and surround the anus. Or it may be found on one side of the vagina or surround it more or less completely. If, on the other hand, rupture takes place between the pelvic fascia and the peritoneum, the blood may ascend to the iliac fossa and thence to the region of the kidney or in front up to the umbilicus. Very rarely there are two collections of blood, which may even communicate so as to form an hour-glass-shaped cavity.

The blood is at first fluid, but coagulates later. It may become absorbed, or the tumor may rupture, form an abscess, or become gangrenous.

The formation of a thrombus is a rather rare affection, occurring on an average only once in 1500 confinement cases.

Etiology.—Little is known about the cause of a hæmatoma. So much is sure that varicose veins, which are so common, have nothing to do with it. During pregnancy it is rather rare and of minor importance. The same applies to the puerperal state. It is by far more common and more important during labor. The inherent congestion of the genitals may predispose to it, and so may the hydræmic condition of the blood, physiologically found during pregnancy; but the true exciting cause is, doubtless, mechanical. By the pressure exercised by the presenting head the tissues are torn asunder below the integument, and the hollow thus formed fills with blood from the torn small arteries, veins, and capillaries. Sometimes the formation of the thrombus follows the application of the forceps. When it appears in childbed, it is likely that the injury took place during labor; that a small hæmatoma was developed, but overlooked; and that coagula were formed and later displaced, thus giving rise to new extravasation of blood.

Very rarely the hæmatoma arises late in the puerperium, in consequence of physical exertion.

It has been noticed that hæmatoma is found unusually often after the birth of the first child in twin pregnancies, where it probably is due to the rapid diminution of the uterus and passage of the fœtus.

Thrombus is more common in pluriparæ, but not more so than one would expect from their proportion to primiparæ. Sometimes coition seems to be the cause, which may be explained both by physical injury and determination of blood to the genitals.

Symptoms.—The patient complains of a grinding pain in the genitals, sometimes irradiating into the iliac fossa or higher up in the abdomen, or down to the knee. She feels a desire to evacuate the bladder and the bowel.

There appears suddenly a swelling in the labia or in the vagina, or in the upper part of the true pelvis and in the false pelvis. The size of the swelling varies from that of a walnut to that of a fetal head or more. The skin or mucous membrane over it has a purplish color. The tumor is immovable. At first it is soft or even fluctuating. Later it becomes doughy, then hard, and may on pressure give the crunching sound of a snowball being pressed. The tumor may be reabsorbed, or, if it suppurates, it will again soften and become fluctuating. It may also rupture and give exit to blood, partly clotted, partly fluid. The skin or mucous membrane covering it may become black and mortified and exhale a fetid odor. The hemorrhage, then, may remain internal or become external.

Diagnosis.—The pain, the sudden appearance of a tumor, and the hemorrhage, be it internal or external, are so characteristic that hæmatoma can scarcely be confounded with anything else.

Prognosis.—In pregnancy and the puerperium the prognosis is good, but during labor the formation of a hæmatoma is a grave accident, that in a large proportion of cases ends fatally, both for mother and fœtus. The danger for the mother is commensurate with the size of the tumor and the loss of blood, whether it flows out or remains in the tissues of the body. Besides the danger from loss of blood, there is a secondary danger of septicæmia.

The worst form is the vaginal hæmatoma appearing during labor, because it is apt to rupture spontaneously or must be opened in order to make room for the fœtus.

Treatment.—If the hæmatoma forms during pregnancy, the patient should be kept in bed, on light, cool diet. The bowels should be kept open with saline aperients. The skin and the vagina should be disinfected. The external genitals should be covered with compresses wrung out of ice-water and constantly changed, or, what is more convenient, covered with a rubber bag containing ice. A moderate pressure may also be exercised from within by placing a small bag moderately filled with ice-water in the vagina. The skin may be both hardened and disinfected by covering it with a pad wrung out of Burow's solution (acetate of aluminum). Absorption may be furthered by using compresses dipped in ice-cold tinctura arnicæ or extractum hamamelis diluted with eight parts of water. Another absorbent highly praised by railroad surgeons is—

℞ Tinct. capsici,
Mucilag. acaciæ, āā ℥i;
Glycerini, ʒss;

which is repeatedly painted on the skin.

While moderate pressure furthers absorption, any violence must be deprecated, as it may extend the blood farther away, displace clots, or rupture the integuments.

If an abscess forms, it should be opened, the cavity washed out with ice-cold or very hot antiseptic fluid, but the walls should not be scraped for fear of dislodging protecting clots. The cavity should be packed with iodoform gauze or sterilized gauze. Externally an antiseptic dressing with compression should be applied, and changed according to the general rules of surgery.

If the hæmatoma ruptures during pregnancy, the opening should be enlarged, clots turned out, and the cavity filled as just described.

During labor we should as long as possible try to preserve the hæmatoma intact, and end labor as soon as possible, but if the tumor opposes an insuperable obstacle to the passage of the fœtus, it must be incised in its most declivitous part; but, as great hemorrhage may be expected, the obstetrician must have everything in readiness for local and general treatment according to the rules laid down above.

After the delivery of the placenta it is best to use an expectant treatment, but if the parts look gangrenous it is better to open the tumor and pack it. If the cavity is very large, counter-openings may be made and drains inserted in different directions.

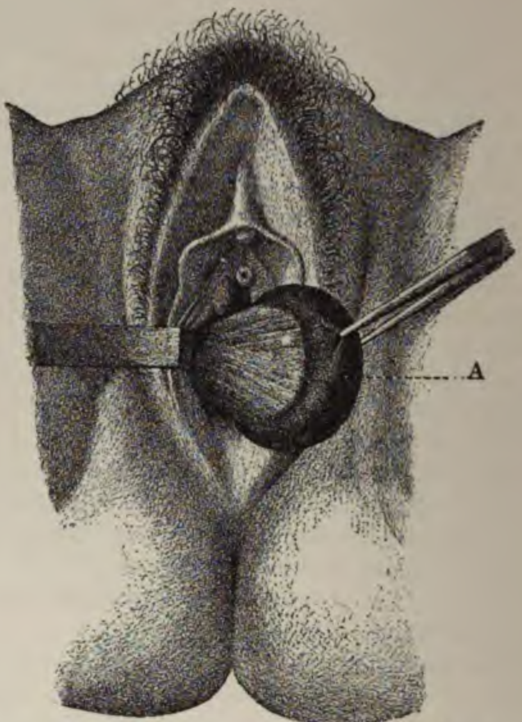
The *superficial, pediculated hæmatoma* is still rarer than the interstitial. It is always situated in the median line of the posterior wall of the vagina, to which it is attached by a longitudinal pedicle (Fig. 392). It is found only during pregnancy, and only during the latter part of the same. It forms a sausage-shaped mass in the vagina, and is situated quite superficially, so as not to implicate the rectovaginal septum. On account of this position it is supposed to be formed in a remnant of the partition that in early fetal life separates the two Müllerian tubes.

After a few days the whole tumor falls off like a ripe fruit or bursts, giving outlet to clotted blood.

The superficial form is entirely benign, and does not even call for treatment, beyond small antiseptic injections during the healing process.

§ 8. **Thrombus, or Hæmatoma, of the Cervix.**—There are a couple of cases on record in which a hæmatoma formed in the cervix. In one case there was moderate hemorrhage from a swollen cervix before delivery, which ceased when the child was born. In another, the hemorrhage, which ended fatally in an hour and a half, did not appear before five days after delivery. The autopsy showed the cervix to be the seat of a cavity of the size of a small orange, into which opened several blood-vessels.

FIG. 392.



Superficial pedunculated hæmatoma of the vagina. (Tarnier and Budin, l. c.) *A*, the tumor pulled out with a thumb-forceps; behind it is the pedicle.

The *diagnosis* is made with the finger and the speculum. Hæmatoma differs from rupture of the uterus by having a closed cavity, not communicating with the abdomen.

The *treatment* would consist in a thorough tamponade of the cavity, the cervix, and the vagina.

§ 9. **Childbirth without Loss of Blood.**—Some loss of blood is a normal feature of childbirth. With a macerated fœtus bloodless delivery is, however, sometimes observed, a phenomenon which probably is due to the destruction of the blood-vessels of the decidua and thrombosis of the placental sinuses.

CHAPTER XI.

ECLAMPSIA.

NEXT to hemorrhage eclampsia is the most dangerous complication of childbirth, and often the two are combined. With respect to this formidable disease the reader is referred to what has been said above (p. 325), when we first met it as an accompaniment of pregnancy.

CHAPTER XII.

HEART DISEASE.

VALVULAR heart disease is a serious complication of labor. The greatest danger is immediately after the birth of the child, but the views of authors differ much as to the real nature of the trouble. Some think it is due to the diminution of abdominal pressure, the large vessels of the abdominal cavity drawing the blood away from the heart. Under this theory the best treatment is compression of the abdomen with bandages and sand-bags.

Others have the diametrically opposed view that too much blood is thrown back on the heart, and, unless the patient has already lost much blood, their remedy is venesection. The former theory seems much more plausible, and I recommend, therefore, the corresponding treatment.

The efforts and fatigues of labor may in themselves overtax a diseased heart. No wonder, therefore, that patients suffering from valvular heart disease are liable to fainting-spells and even sudden death during labor. The muscular tissue of the heart is even said to have undergone fatty degeneration during pregnancy.

Labor should be abbreviated as much as possible. (Compare p. 343).

CHAPTER XIII.

RUPTURE OF ORGANS.

THE force developed during labor may be so great that soft organs rupture, strong ligaments are torn, and even solid bones are fractured.

§ 1. **Rupture of the Uterus.**—In speaking of rupture of the uterus, we do not mean the tears in the vaginal portion, which are so common that they almost may be considered as an attribute of normal childbirth, or those extending somewhat higher up in the cervix and implicating the parametrium. The lesion we now contemplate is a tear originating in the supravaginal portion of the cervix and the lower uterine segment, or at the fundus of the uterus. The tear may go through the whole thickness of the wall—*complete* rupture—or the peritoneum may resist—*internal incomplete* rupture—or the peritoneum alone and part of the outermost muscular fibres may rupture while the uterine cavity remains intact—*external incomplete* rupture.

Rupture of the uterus is so rare an accident that even experienced obstetricians may never have seen a case. According to Dutch statistics, there was 1 case in 2333 confinements; in France, 1 in 3403; and in London, 1 in 5495. In America rupture of the uterus is still rarer than in Europe, which must be attributed partly to the comparative rarity of the higher degrees of pelvic distortion and partly to the fact that most confinements in this country are in the hands of physicians, who know how to avert this terrible lesion by timely interference. For the latter reason the event is also much rarer in lying-in institutions than in private practice.

The incident being to a great extent preventable, the obstetrician in whose practice it happens exposes himself to blame, and even to a suit for malpractice. The general practitioner should, therefore, not be tempted by its rarity to slight it, but should make himself thoroughly acquainted with its symptoms and treatment. Personally, the writer has operated on only one case in consultation,[1] and in his capacity as pathologist to the New York Obstetrical Society made a circumstantial report based on macroscopical and microscopical examination in another case.[2]

Etiology.—The uterus may rupture *during pregnancy* or during labor. Rupture may occur as early as the third month of pregnancy, but is much more common towards the end. We have already seen that pregnancy in the undeveloped horn of a bicornute uterus and in the intra-uterine portion of the tube, so-called interstitial pregnancy, is apt to end in rupture. Falls, kicks, blows, and similar injuries may cause it. In such cases sometimes the whole unruptured ovum may escape into the abdominal cavity. The cicatrix after Cæsarean section is apt to give way during a new pregnancy. This was particularly the case formerly when no sutures were used, but happens even nowadays when the edges of the incision in the uterus have been carefully brought together. Sometimes a fistula left after Cæsarean section and forming a connection between the interior of the womb and the skin or the bladder has given rise to rupture. In other cases repeated removal of an adherent placenta seems to have left the wall in a weakened condition. In others, again, the wall was the seat of fibrous cancerous degeneration. It has also been alleged that it might be a state of fatty degeneration, but without proof. In the speci- en that I examined I paid special attention to this point, and found e muscular tissue entirely normal. Insertion of the placenta at the ndus has led to overdistention and rupture of this part of the uterus. upture occurs much more frequently in pluriparæ and multiparæ an in primiparæ. Advanced age has unmistakable influence as predisposing cause, most of the patients being between thirty and rty years old. Some cases are undoubtedly due to the administra- on of ergot when there is a mechanical disproportion. We have also en that a clumsy use of instruments in criminal abortion may lead rupture of the uterus, with prolapse of the intestine.

---

[1] Garrigues, "A Case of Laparotomy for Ruptured Uterus," The Medical News, March 3, 1888, vol. lii., No. 9, p. 225.

[2] Garrigues, Amer. Jour. Obst., 1881, vol. xiv. p. 403.

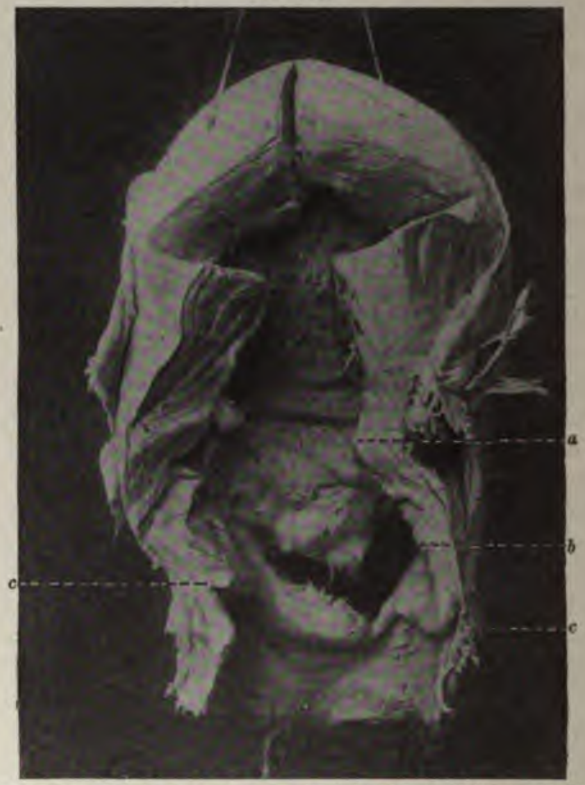
When the fœtus is pushed into the abdominal cavity, in exceed- ly rare cases it has become changed into a lithopædium. Still er it continues to live till the end of pregnancy. Generally putre- tion sets in and the patient dies of septic peritonitis.

Rupture *during labor* is, however, by far more frequent than that ring pregnancy. The chief conditions that lead to it are a narrow vis, neglected cross-birth, and hydrocephalus. The mechanism by ich the rupture is produced is well known. There being a dispro- tion between the object propelled and the canal through which it uld pass, the active part of the uterus above the contraction ring tracts more and more, and pushes the fœtus into the passive part, he lower uterine segment and the cervix,—which becomes more l more distended and finally gives way. The chief seat of the tear ust below the contraction ring, on the posterior surface, on the erior, or on both (Fig. 393). Another place of predilection is the ral aspect of the cervix, where the tear runs in a longitudinal ection and may extend into the body or into the vagina. Often a gitudinal tear is combined with a transverse, and complete and omplete tears may be combined. The edges of the tear are thin, ged, and infiltrated with blood.

When the tear is produced as just described, it is called a *ntaneous* rupture, in contradistinction from an *artificial* rupture, ich is directly referable to the interference of the obstetrician. If, instance, the passive portion of the uterus is distended to its nost limit, and the accoucheur tries to introduce his hand in order perform version, the canal must rupture. Or, if there is room ough for his hand to seize a foot, the movement imparted to the tus, especially the head, may result in the rupture of the uterus. metimes the distention is much more marked on one side than on other. In cross presentation this will be the side in which the ad lies, and in head presentations in a flat pelvis the occiput is ble to slide to a side, and this portion is then in greatest danger of being ruptured. With a pendulous abdomen it is the posterior wall that is most exposed. Lateral obliquity of the uterus drives the presenting part over to the side opposite to that in which the fundus lies. Such partial distention imparts a slanting direction to the contraction ring, which is pushed down on the menaced side. The corresponding round ligament is also stretched and forms a tense ridge even during the interval between labor-pains.

Symptoms.—If the obstetrician follows the rules laid down in different parts of this work, neither a contracted pelvis, nor a cross presentation, nor a hydrocephalic head can escape his attention; but if nothing else has told him so, the mere fact that labor does not progress should impel him to make a thorough examination, when he in all probability will find the cause. Sometimes the general condition of the patient may contain a hint of impending danger of rupture. She may complain of pain even in the interval between contractions. She may be anxious and restless. Her pulse may be small, hard,

FIG. 393.



Rupture of the anterior wall of the cervix uteri. (Wood's Museum, Bellevue Hospital, No. 1139.) One-third actual size. *a*, contraction ring; *b*, rupture; *c c*, external os.

and rapid. There may be a little rise in temperature. A mere glance at the abdomen may reveal the high position of the contraction ring,—on the level of the umbilicus, or even above. The broadness of the abdomen may indicate the presence of a transverse presentation. The large hydrocephalic head may be felt through both the vagina and the abdominal wall. The faulty presentation of the fœtus is at once ascertained by abdominal palpation. The narrowness of the pelvis is found by means of pelvimetry.

When the rupture actually takes place, the patient may feel a severe abdominal pain, and the tearing of the tissues may even be accompanied by a sound audible to bystanders.

Unless there is impaction, the presenting part recedes and is no longer within reach, or it has been supplanted by another part of the fetal body. Labor-pains cease at once. Blood flows from the genital canal. The place where the rupture has occurred becomes sensitive to pressure. The usual signs of loss of blood—coldness and clamminess of the skin, pallor, dyspnœa, faintness, syncope, pulselessness—may develop. Sometimes the patient vomits. The fœtus may be felt through the abdominal wall lying in the abdominal cavity, side by side with the contracted uterus. By vaginal examination the tear itself can be felt; and sometimes knuckles of the intestine may prolapse through it. If the rupture is extraperitoneal, two other symptoms may develop. One is subcutaneous emphysema, which is recognizable by the sensation of air-bubbles moving under the fingers in palpating the abdomen, and by a peculiar crepitant sound heard when the skin is being palpated. This phenomenon is due to the entrance of atmospheric air into the subcutaneous connective tissue. The other is the formation of a hæmatoma under the pelvic peritoneum.

Diagnosis.—The diagnosis may not be easy, all symptoms being little marked or absent, and the child may even be born *per vias naturales.* It is particularly the incomplete rupture that may be difficult to recognize; and if there is one, it may be mistaken for a complete rupture, the intestinal knuckles being felt so plainly through the thin peritoneum that they may seem to be in direct contact with the examining fingers. The chief diagnostic symptoms are the sudden, severe pain in the abdomen, the hemorrhage from the genital canal, the arrest of labor-pains, the retrocession of the presenting part, the palpation of the tear itself, and of the fœtus in the abdominal cavity outside the uterus.

When the rupture occurs during the performance of version, it is accompanied by hemorrhage, and the operation all of a sudden becomes easy.

Prognosis.—For the fœtus the prognosis is almost absolutely bad.

It bleeds to death or it becomes asphyxiated by the detachment of the placenta. Among the mothers there is also a great mortality. Still, one out of six is said to recover. Some die promptly from hemorrhage or nervous shock, and the others a few days later from peritonitis.

Treatment.—There is a large scope for prophylaxis, as evinced by the fact that the lesion is much rarer in hospitals and in the hands of experienced obstetricians than in private practice, especially that of midwives. For a practised eye the high position of the contraction ring is an unmistakable warning of the impending danger. The only condition at all like it may be produced by a full bladder, and in this respect all doubt is dispelled by the use of the catheter. Another characteristic point is the tension of the round ligament, which continues in the interval between contractions. Careful examination should be made both during contractions and in the interval, which will enable us to distinguish the thick, contracted, active part of the uterus from the thin, dilated lower portion.

When there is much tension of the cervix and the lower uterine segment, version is contraindicated, and, if at all attempted, the operation should be interrupted during uterine contraction.

Postural treatment is of great importance. When rupture threatens on one side, the patient should be placed on this side, whereby the fundus sinks down on the couch and the lower part of the uterus rises in the opposite direction. A pendulous abdomen should be held in place by a binder. The elevated-pelvis position, facilitating version in a high degree, will probably prove of great value as a prophylactic of uterine rupture, and render the operation possible under circumstances in which heretofore it was impracticable.

The labor should be finished as soon as possible. Since the fœtus is practically lost anyhow, its life should not be considered. If the head presents and the fœtus is alive, a cautious attempt may be made to apply the forceps. If this does not succeed, the head should be perforated and extracted with the cranioclast or the cephalotribe. If the child is dead, this is, of course, done at once, and likewise if it has hydrocephalus. In neglected cross presentation embryotomy has to be performed.

For rupture occurring during pregnancy there is only one rational treatment,—laparotomy, removal of the fœtus and ovum, and suture of the tear.

If rupture occurs during labor and the fœtus is partially in the uterus, it should be extracted through the genital canal. If the head presents and is partially engaged, it may be extracted with the forceps. If this instrument cannot be applied, the head should be perforated and extracted with cranioclast. If a foot can easily be reached, it should be seized and extraction made in this way.

After the extraction of the child a careful examination should be made of the tear. If it is found to be extraperitoneal and hemorrhage has stopped, it is best only to put in an iodoform gauze drain. It is not safe to inject any fluid, as there might be a small communication with the abdominal cavity, or protecting clots be dislodged by the stream.

If there is hemorrhage from the depth of the wound, it will hardly be possible to expose its source so as to be able to tie bleeding vessels or circumvent them with a threaded needle. We must then rely on tamponade, which must be tight enough to prevent hemorrhage, and still the tampon must not be packed so hard as to tear the peritoneum. As material only sterile gauze or iodoform gauze should be used. With this internal tamponade may to advantage be combined external pressure, by surrounding the uterus with large pads held in place with a tight binder, from which two tails are carried from behind, crossed over the vulva, and pinned in front.

If the peritoneum has been torn and the fœtus lies in the abdominal cavity, laparotomy should be performed, the fœtus removed through the incision, and the peritoneal cavity cleaned of clots and meconium. What more should be done depends on what we find. If there are no indications of infection, it is best to stitch up the wound with deep and superficial sutures and close the abdomen. If, on the other hand, there are distinct symptoms of infection—if the patient has fever or there are signs of putrefaction—the uterus and appendages should be removed. If the tear does not extend below the internal os, it is enough to perform supravaginal amputation,[1] with retroperitoneal treatment of the pedicle. Simply to surround the cervix and broad ligaments with an elastic ligature, cut off the uterus and appendages, and treat the stump by the extraperitoneal method[2]—*Porro's operation*—is less good, on account of the long after-treatment and the danger of consecutive ventral hernia. If the lower end of the rupture cannot be reached by supravaginal amputation, it is better to perform total hysterectomy.[3]

The placenta should be removed from wherever it is found. If it is in the uterus, it may, perhaps, be expressed in the usual way. If not, it is detached by the vaginal route. If it is in an extraperitoneal cavity, we follow the cord till we reach the placenta and remove it through the tear. If, finally, it lies in the abdominal cavity, we remove it through the abdominal incision.

The above rules apply to lying-in hospitals and private practice in so far as it is feasible to follow them. But suppose the physician stands alone in a farm-house or a tenement-house. What can he do then? He can do a great deal, and he ought to do it. To leave the patient is almost to doom her to sure death, which he should so much less think of as perhaps he is not without blame for the deplorable condition in which the patient is situated. Under all circumstances the accoucheur should remove the fœtus and the placenta by the genitals, which often has proved to be an easy matter. Secondly, if there is any hemorrhage he should put in a tampon. If the intestine is prolapsed, he should replace it and keep it up with iodoform gauze on the top of his tampon. If ice is available, it is well to place an ice-bag over the symphysis. On the third day, all danger of hemorrhage being passed, he may remove the tampon and replace it by a gauze drain. After four or five days he may wash out the cavity with plain water, and still later with antiseptic fluid. By a treatment conducted on such lines many women have recovered.

---

[1] Garrigues, Diseases of Women, third ed., p. 518.

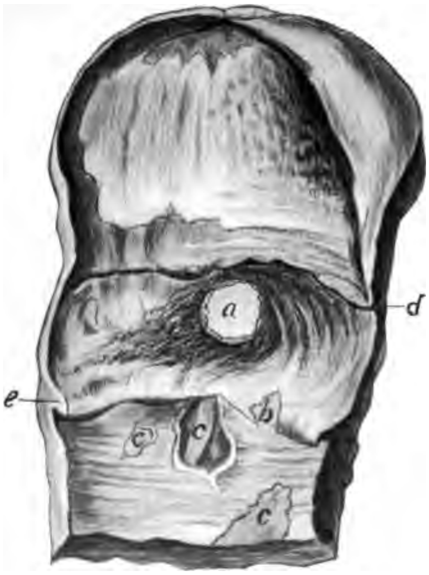
[2] Ibid., p. 519.

[3] Ibid., p. 521.

After the special indications offered by the rupture have been filled, and partly even while they are being attended to, attention should be paid to the general condition of the patient, as detailed above in speaking of hemorrhage.

§ 2. **Pressure Necrosis of the Uterus or Vagina.**—When the uterus or the vagina is exposed to protracted pressure on a limited area, the compressed tissue becomes mortified and is expelled, leaving a circular opening or loss of substance (Fig. 394).

FIG. 394.



Pressure necrosis of uterus. (Winckel.) *a*, perforation of cervix; *b*, laceration of cervix; *c c*, tears in the vagina; *d*, contraction ring; *e*, external os.

The necrosis may go through the whole thickness of the wall, resulting in a communication between the parturient canal and the pouch of Douglas or the bladder, or it may be more superficial, non-penetrating.

The most common seat of the necrosis is in the posterior wall of the cervix, near the median line, where it is produced by pressure against the promontory. Next in frequency it is found on the anterior wall of the cervix or of the vagina, in which locality it is due to pressure against the symphysis pubis. More rarely the necrosis is produced by pressure against osteomas, sharp lines, or thorns on the pelvic wall. It may also be due to the pressure exercised by instruments used in obstetric operations, especially the forceps, the cranioclast, or the cephalotribe.

When the partition between the cervix and the pouch of Douglas is perforated, the lochial discharge may flow into the peritoneal cavity and give rise to septic peritonitis. In more favorable cases an adhesive peritonitis surrounds the opening and prevents communication with the abdominal cavity. The uterus then remains adherent to the promontory, and the adhesion has even been observed to become ossified so as to form a kind of thorn. Sometimes a rectovaginal fistula is formed.

A perforation in the anterior partition leads to the formation of a vesicovaginal fistula, or more rarely a vesicocervical fistula, conditions entailing the constant dribbling away of the urine through the vagina, which deplorable infirmity was practically incurable until the genius of Marion Sims taught the surgeons how to remedy it.

Diagnosis.—The diagnosis may be quite difficult, unless a urinary fistula is established, when it is only too evident. The tediousness of the labor, followed by signs of puerperal infection, may make the obstetrician surmise the presence of a perforation. Upon vaginal examination with finger and speculum he may be able to feel the opening, if it is large enough, or to see it through the speculum. A small urinary fistula may be made visible by injecting a little lukewarm milk into the bladder. An opening communicating with the abdominal cavity may not be found until it is revealed in the autopsy-room.

Prognosis.—The prognosis for the mother is better than in rupture of the uterus, and for the child there is little danger.

Treatment.—The treatment is chiefly prophylactic. The formation of the perforation should be prevented by giving an enema before delivery, by the use of the cathether, and by timely obstetrical operations. In cases of communication with the abdominal cavity, all we can do is to use mild antiseptic vaginal injections—plain water, boracic acid, or Thiersch's solution—and treat the peritonitis. A small fecal or urinary fistula may be made to heal by keeping the parts as clean as possible, insuring easy movements of the bowels, and preventing the urine from becoming alkaline by the administration of benzoate of lithium, ammonium, or sodium (gr. v to xxx—from 30 centigrammes to 2 grammes—t. i. d.), acidum nitricum dilutum (♏ viii), or Horsford's acid phosphates (a teaspoonful in a wineglassful of water) three times a day. A large fistula will remain open and require a gynæcological operation when the time of involution is passed,—say, in two or three months after confinement.[1]

---

[1] Garrigues, Diseases of Women, third ed., p. 385 *et seq.*

§ 3. **Laceration of the Cervix Uteri.**[1]—Small tears in the circumference of the os expanded to its utmost capacity during the passage of the head of the fœtus are so common that they may be looked upon as an inherent part of childbirth; but in other cases these lacerations acquire such dimensions that they constitute a more or less serious injury, which may offer immediate danger and lead to later invalidism.

By far most commonly the tears follow the direction of a radius of the os so as to form a Λ-shaped solution of continuity in the cervical portion of the uterus. They may be *complete*—that is to say, go through the whole thickness of the cervix—or *incomplete*, when the tear in the cervical canal does not reach the mucous membrane of the vagina. There may be one, two, or more tears. The one most frequently observed is the *bilateral*, and next to that the *unilateral*, which is more frequent on the left than on the right side, a difference which doubtless is due to the preponderance of the left occipito-anterior position of the fœtus. Tears in the anterior or posterior lip alone are rarer. The laceration may also be *stellate*, which is produced by at least three tears forming a star-like figure. The tear extends often more or less beyond the vaginal junction and enters the parametrium or the connective tissue behind the uterus, or it implicates the bladder. Much more rarely the tear is transverse. If then it is combined with a radial tear the two together form an Γ, or the end of the anterior or posterior lip of the cervix may be torn off or even the whole cervical portion be thrown off as a ring-shaped body.

These tears are particularly apt to occur in old primiparæ, in whom the tissue has lost its normal elasticity. They are often produced when for some reason or other it becomes necessary to extract the fœtus before full dilatation has been obtained, or in the endeavors to establish this dilatation.

Most of these lacerations heal either by first or second intention, and do not give rise to any immediate or remote trouble; but in some cases they become more or less serious complications of childbirth. Deeper tears may cause serious hemorrhage when the compression exercised by the presenting part ceases after the birth of the child. The extension of the tear into the loose tissue of the parametrium may lead to puerperal infection and death. The implication of the bladder may result in a vesicovaginal or vesico-uterine fistula. Frequently the laceration of the cervix is followed by chronic inflammation of the neck and body of the uterus.[2]

---

[1] Garrigues, "Laceration of the Cervix Uteri," Archives of Medicine, vol. vi., No. 2, October, 1881; "The Immediate Closure of Laceration of the Cervix," Amer. Jour. Obstet., vol. xxiv., No. 11, 1891.

[2] Garrigues, Diseases of Women, third ed., p. 416.

Treatment.—Since most cervical lacerations heal by nature's sole efforts, they do not call for any immediate treatment unless they give rise to hemorrhage. Otherwise we would without necessity expose the patient to infection during the primary operation.

The presumptive *diagnosis* of the cervix being the seat of the hemorrhage is made by exclusion. If the uterus is well contracted we know the source of a post-partum hemorrhage cannot be the body of the uterus, and the vulva and part of the vagina may be directly inspected. The tear in the cervix may be felt, and the cervical portion and the upper part of the vagina may be made visible by means of a speculum. Often it is also possible to press the uterus so low down into the pelvis that the cervix is brought into view without a speculum.

The best treatment is to unite the lips of the tear by catgut suture, which not only arrests the hemorrhage, but also effects union by the first intention. Sometimes a thorough tamponade of the vagina, and, if deemed necessary, of the uterus too, will master the hemorrhage.

§ 4. Laceration of the Vagina.—Lacerations of the vagina are especially liable to occur at the upper end, where the vagina forms the continuation of the cervical canal, and at the lower end, the entrance to the vagina being the narrowest part of the parturient canal.

The tears in the upper portion may penetrate into the abdominal cavity, and then they become much like similar ruptures of the uterus. The direction is mostly transverse, and the tear takes place on the anterior or the posterior wall, or it may extend around the whole circumference, when the vagina *in toto* separates from the cervix—so-called *colpaporrhexis*. The symptoms, prognosis, and treatment of such lacerations are essentially the same as when the laceration occurs in the body of the uterus. In regard to diagnosis, there is this difference, that labor-pains do not cease so abruptly as in rupture of the uterus, and that there is less hemorrhage and shock.

There may also occur longitudinal tears in the vagina, which may be superficial, and then are of comparatively little consequence, or extend through the whole thickness into the perivaginal connective tissue, when they may give rise to considerable hemorrhage and open the way for wide-spread puerperal inflammation.

At the entrance to the vagina [illegible] tears are very common, especially on the posterior [illegible] In primiparæ they may almost be looked upon as [illegible] childbirth, but they may also be found [illegible] children before. By [illegible] and pressing forward, this laceration is seen as a [illegible] angles above and below and [illegible] towards the sides.

In the lower part of the vagina tears often occur in connection with those of the perineum, which presently will be considered. In exceedingly rare cases the tear occurred in the rectovaginal septum and the child was born per rectum.

Treatment.—Superficial tears in the vagina hardly call for any treatment beyond the common prophylaxis we have recommended for all labor cases. They will either unite by mere apposition of the edges or suppurate, when the wound secretion will mix with the lochial discharge coming from the uterus. Deep lacerations should be closed by sutures, either running or interrupted. If the necessary instruments, materials, and assistance are not present and there is bleeding, recourse must be had to styptic applications or tamponade. In a case of birth through the rectum, a double row of sutures should be applied—one in the rectum, another in the vagina.

Protracted pressure against limited points of the vagina may lead to subsequent necrosis. If the anterior wall is compressed between the fetal head and the symphysis pubis, the result may be the formation of a vesicovaginal fistula. In order to prevent this serious injury, the prolonged pressure should be avoided by timely use of the forceps. Instruments are, however, apt to cause injury themselves, and should, therefore, be applied deliberately, cautiously, and skilfully, bearing in mind that in most cases the safe delivery is much more a question of gentleness and dexterity than of brutal mechanical force.

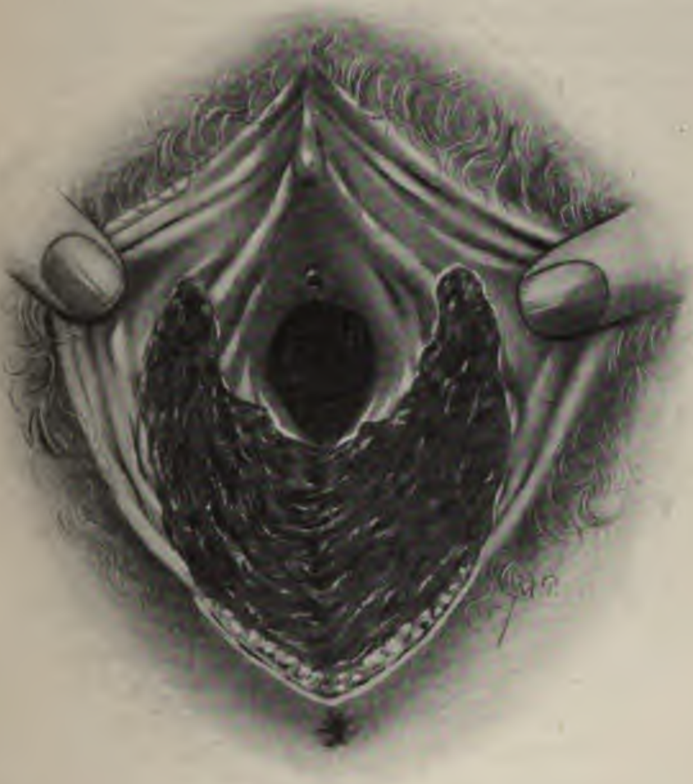
§ 5. **Laceration of the Vulva and Perineum.**—Towards the end of parturition the perineum becomes enormously distended, elongated, and thinned, and, since the normal tissue, even outside of childbirth, ends with the thin, sharp edge formed by the fourchette, some degree of tear at this point is exceedingly common.[1]

The parturient canal is, near and at its end, limited by two comparatively narrow openings,—the entrance to the vagina and the rima pudendi,—the first of which is circular from the beginning, while the second becomes so when distended by the fœtus being pushed through it. Of these rings the inner one is again the narrower, but formed by stronger muscular and sinewy tissue than the outer, which is only composed of the skin and subcutaneous fat. These two rings are the seats where laceration commonly begins during childbirth, and from which it may extend more or less into the neighboring tissues. The inner ring, being the narrower of the two, suffers more constantly, but a superficial tear here, even if it extends far up into the vagina, is of little importance. A deep tear of this ring, involving the levator ani muscle with its two fasciæ, is, on the contrary, a fruitful source of future suffering. The tear in the levator ani muscle is usually found backward and outward in the direction of the tuberosity of the ischium, probably because the muscle gets caught between this point and the head, while in the median line the rectum furnishes a soft pad between the vagina and the levator ani muscle. The tear is much more common on the right than on the left side, which is presumably due to the preponderance of the left occipito-anterior position, the occiput escaping from the parturient canal, while the broad forehead is pressed against the posterior wall of the vagina.

---

[1] Garrigues, "The Obstetric Treatment of the Perineum," Amer. Jour. Obst., vol. xiii., No. 2, April, 1880; "So-called Laceration of the Perineum," Medical News, April 25, 1891.

FIG. 395.

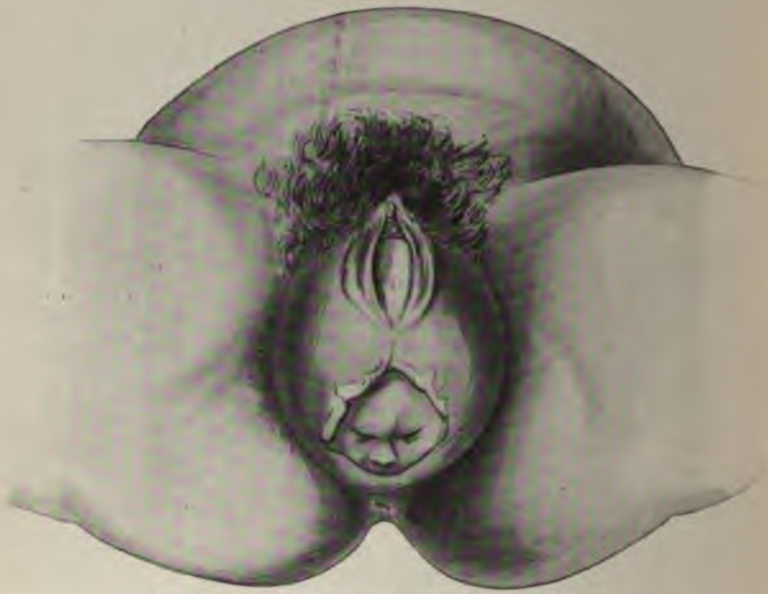


Laceration of the perineum and vagina.

The external ring, formed by the expanded rima pudendi, often escapes all injury through childbirth, so that even the thin edge of the fourchette may be found entire in women who have borne children. It may, however, suffer in different places. The most common is a tear in the median line, beginning at the posterior commissure, from which it may extend down to and into the rectum and up to or through the entrance to the vagina. In the minor degrees the torn surface has the shape of a double triangle, the two halves being contiguous in the depth of the wound (Fig. 395). When the tear does not break the anal ring, it is called an *incomplete* laceration of the perineum; when it extends into the rectum, it is called a *complete* laceration.

More rarely the laceration begins in the centre of the perineum (Fig. 396) and extends into the vulva, forming a similar tear, as if it had started from the fourchette. Sometimes the more elastic skin resists, while the muscular and fascial tissues are severed. In rare cases the reverse may take place, the skin bursting, while the deeper parts stand the dilatation uninjured. In the rarest cases the tear in the perineum becomes sufficiently large to admit the passage of the fœtus through it without implicating the rima pudendi or the anus,—a so-called *central* laceration (Fig. 396).

FIG. 396.



Central laceration of the perineum. (Ribemont-Dessaignes.)

If the perineum escapes or suffers little, the injury often takes the shape of superficial tears on the labia majora or deeper ones in the labia minora and vestibule near the clitoris, which may give rise to dangerous or even fatal hemorrhage.

Nearly all tears being due to circular expansion, the parts ordinarily separate from side to side, and the rents have a longitudinal direction, more or less parallel to the axis of the parturient canal; but if the severed halves of the perineum do not unite by primary intention, they heal separately, each forming one-half of a cicatrice, in which way cicatrices with a transverese direction are formed.

Sometimes nature can effect complete agglutination and coalescence by first intention of any tear, complete or incomplete. But such a process is of so extremely rare occurrence that it would be foolhardiness to expect it. In the great majority of cases the spontaneous healing is altogether insufficient. An incomplete tear in the median line will grow a little together by granulation at the top of the angle. The remainder will only heal over and form a contracted transverse scar. A complete tear will leave the anal ring broken: the sphincter retracts, its ends being plainly marked by a little pit of the size of a large pea on either side. Where the perineal body should be there is a Λ-shaped cleft. The mucous membrane of the rectum rolls out, forming a little red, soft, puckered protrusion at the posterior circumference of the anal opening. The patient has no control over flatus and fæces, which escape involuntarily, and make the poor woman a subject of disgust to herself and others.

A tear involving the levator ani muscle and the sinewy structures of the entrance to the vagina weakens the support of the pelvic structures situated above. As soon as the patient gets up from childbed, she complains of a disagreeable feeling of looseness and bearing-down, and in the course of time a complete prolapse of the uterus and inversion of the vagina may be the result.

Etiology.—The obstetric canal forms a curved cylinder (Fig. 195, p. 155). The propelling force acts from above almost under right angles to the plane of the brim of the pelvis. When the os coccygis is reached, this movable organ is bent backward and straightened out. The perineum is much elongated, so that the distance from the anus to the vulva may measure five or six inches (13–15 centimetres). No wonder, then, that this thin, weak structure is apt to give way under the pressure that is exercised on it. Besides this general danger to which every perineum is exposed during childbirth, there are particular unfavorable circumstances that jeopardize its integrity. Thus, the vagina and vulva may be too small or the fœtus too large, or the tissue is not elastic enough, as is especially the case in very young or old primiparæ. The pelvic inclination may be too small, the sacrum too straight, or the pubic arch too narrow. The perineum may be too long and the perineal body too thin. Œdema, varices, condylomas, vegetations, ulcerations, and scars, all predispose to laceration. Cross or brow presentation, occipitoposterior position, or the prolapse of an arm beside the head endangers the perineum. A precipitate labor, in which the parts do not have time to become softened and expand gradually, is a frequent cause of laceration of the perineum. The same applies to forceps operations and manual extraction when performed too rapidly. The forceps may also injure the perineal body directly, the shanks being pressed or rubbed against it.

It is hard to ascertain the *frequency* with which the perineum is torn, but in general we may say that even with good treatment it happens in about 25 per cent. of primiparæ and 5 per cent. of pluriparæ. Its occurrence is by no means always the fault of the accoucheur. He has therefore no occasion to be ashamed of it or try to conceal it.

Prophylaxis.—Much may be done to prevent or limit a laceration of the perineum. Since it is a chief point in this respect that the lower part of the obstetric canal shall have time to become softened and dilated, ergot ought never to be given during labor.

The bowels should be emptied with a soapsuds enema before the passage of the fœtus. The position on the left side during delivery is preferable to that on the back, because in the former the fundus uteri sinks down on the bed, so that gravitation works in an almost opposite direction to the uterine contractions. Thus the perineum has not, as in the dorsal position, to carry the weight of the fœtus in addition to the pressure against it caused by the fœtus being driven down by the expellent forces.

If the waters have broken long before the birth of the child, and the vagina is dry, it is well to pour creoline or lysol solution into it in order to make it slippery during the alternate advance and retreat of the presenting part.

The administration of chloroform while the fœtus passes the vulva is of high value as a protection against laceration. Pain being abolished and the abdominal muscles paralyzed, the child is pushed forward by the mere uterine contractions, and even these are weakened by the effect of the drug.

The fœtus forms a kind of cylindrical body, the vulvar orifice an elastic ring. Now, it is evident that this ring will be stretched the least when its diameter intersects the long axis of the cylinder at right angles. If this relation does not exist, it may be an advantage to displace the posterior part of the ring forwards or backwards, according to circumstances. If the vulvar ring encircles the fetal body in this favorable way, every displacement will only have the effect of subjecting the ring to an unwarranted surplus of stretching, and thereby expose it to break.

Another kind of protection is afforded to the perineum by acting on the fœtus. A too speedy expulsion of the fœtus may be counteracted by direct pressure with the flat hand on the presenting part, especially the cranium. If the head does not recede in the intervals of pains, it is well to push it back, so that the next uterine contraction may be partly spent in recovering lost ground. In this way undue pressure on one point is also avoided. In cases of manual extraction, the head ought to be drawn as slowly as possible through the vulvar orifice. In forceps deliveries it is advisable, if the condition of the mother or the fœtus does not so imperatively call for the utmost speed as to supersede all other considerations, to take off the forceps when the head has been brought into the vulvar orifice and enucleate the head from the rectum.

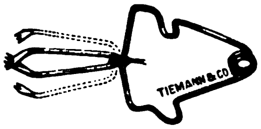
Often we find under the ligamentum arcuatum a free space which may be utilized to lessen the pressure on the perineal body by pushng the presenting part forward. This pressure against the presentng part may be practised directly on it, or to overcome slipperiness we may cover the part with a pad, or the pressure may be directed through the perineum, or, what is preferable, through the rectum. The patient lying on her left side, the index and middle finger of the left hand are introduced deeply into the rectum and pressed against the forehead of the child. We may even during an interval of laborpains slowly press the head out through the vulva by a kind of enucleation. The fingers in the rectum are gradually moved from he forehead of the child to the upper maxillary bones and finally ooked under the chin. Certain precautions must, however, not be eglected in using this method. Above all, we must be careful not to njure the eyes of the child. Another point of great importance is ot to press with so much force as to cause laceration in the region f the clitoris (see p. 193). The proper time for resorting to enucleaion is when the anus is pushed forward and distended and the vertex during uterine contractions is propelled into the vulvar orifice.

The perineum is threatened as much or even more by the passage f the shoulders than by that of the head, in which respect the reader s referred to what has been said in discussing the management of normal labor (p. 193).

If all means hitherto considered do not seem sufficient to save he perineum, we may still try to do so by the operation called *episiotomy*. An incision is made in the labia majora, about half an nch from the median line, in the direction of the tuberosity of the schium. It is best made with sharp, blunt-pointed scissors, and if performed during a labor-pain, the pain from the incisions is little noticed. The operator should be sure to cut behind the aperture of the duct of Bartholin's gland, so as not to injure these organs nor to wound the vulvovaginal bulb, which would cause considerable hemorrhage. The edges of the wounds should be united by sutures, since otherwise they do not heal together, and the vulvar orifice is likely to gape and become triangular. The writer has practically abandoned this operation. It is in most cases uncertain whether a laceration of the perineum will occur or not without episiotomy. The operation is no absolute protection against the tear. If the cuts shall be sutured, we might about as well suture the torn perineum, which is nature's work, as incisions made by ourselves.

Treatment.—As soon as labor is completed, the accoucheur should make an ocular examination of the condition of the perineum by separating the labia majora. In certain cases *serres-fines* may be used to unite the torn perineum. These are small wire clamps ending in two or three fine claws (Fig. 397). They are little used nowadays, but, if well made, they are quite useful in appropriate cases. Tiemann has made some quite satisfactory ones for me. They are one and a half inches long, one-half of which belongs to the legs beyond the crossing. The spring force should be so weak that the accoucheur can put them on the web between his thumb and index-finger without feeling any pain. When the patient is cleaned and lies on her left side, the accoucheur, standing behind the patient, lifts the edges of the wound between his left index-finger and thumb and applies from one to three serres-fines, according to the length of the rent. The one nearest the anus is applied first, at about one-third to one-half inch (1 centimetre) in front of the posterior angle of the tear, the others at a similar distance from one another. The foremost is put on the edge of the fourchette. They are put on at right angles, and should be pushed in as far as they go. Before placing them, the wound should be cleaned with some antiseptic solution. Very seldom it becomes necessary to tie or circumvent an artery or cut off a loose shred of tissue. The pain of their application is insignificant and momentary. They remain in place four days. Their removal causes still less pain than their insertion. When they have been removed, the sides of the rent appear lifted up in a ridge, which subsides within a fortnight. In the places where the claws have pressed are seen minute ulcerations which heal readily. A good instrument never cuts through.[1]

FIG. 397.



Serre-fine.

While they are in place, the knees should be kept tied and the bowels should be kept open with a mild aperient. The patient is allowed to urinate, if she can, and to lie on the back or on either side, as she prefers.

---

[1] Tiemann keeps these little clamps under my name, because I had them made differently from those he used to have and which were very objectionable. The honor of invention belongs to Vidal de Cassis, a Parisian surgeon.

It is hardly possible to indicate in a theoretical way which cases are fit for the treatment with serres-fines. First of all, I would exclude all cases in which the rent extends into the anal canal. Next, cases in which the rent is high, for it is evident that the clamps can exercise their power but a short distance beyond the surface included within their grasp. Also cases where the wound is internal, and the perineum intact. In fat women with hard, unyielding tissues, it is impossible to raise the fold upon which they should be applied, or the deeper layers are withdrawn from the embrace of the clamps, so that they only take hold of the skin. But after subtracting all these conditions, there remains a large number of cases in which they may be used to advantage. On account of the trifling pain and the great simplicity of their application, this procedure can be resorted to in all suitable cases, and it recommends itself especially to the young practitioner who wishes to avoid too much attention being concentrated on the laceration, and to the busy practitioner who is anxiously awaited in other houses. By using serres-fines many a rent will be closed that otherwise would be left unheeded.

In cases that are not fit for serres-fines, *sutures* should be used. If deep rents occurring in the perineal body, while the skin between the anus and the vulva remains intact, do not heal up, they lead to a membranous condition of the perineum which does not give sufficient support to the adjacent parts. This kind of tears ought therefore to be sutured from the vagina and vulva. More commonly the rent extends more or less through the skin and we find the above-mentioned triangles.

In uniting them by suture, we must aim at an accurate adaptation of the edges and at having as broad surfaces as possible. These two desiderata are obtained by placing the sutures in a slanting way. I mentally divide the two edges of the triangle (Fig. 395) into three parts of equal size. Silkworm gut is the best material, being less absorbing than silk and easier to insert and to withdraw than silver wire. The patient is placed across the bed with the buttocks at the edge. The feet rest on two chairs, and the knees are supported by two assistants. The operator sits on a third chair between the two others. Three rather large, curved needles are threaded. The patient is anæsthetized with chloroform, unless she is too weak. If the doctor has no skilled assistant he should anæsthetize the patient himself, and during the operation give the necessary directions about keeping up the anæsthesia. In order to keep the field of operation free from discharge, a large tampon wrung out of antiseptic fluid is pushed up into the vagina above the tear. The first needle, held in a needle-holder, is introduced a quarter of an inch from the left edge of the wound, between the posterior and the middle portion of the edge, and carried in a curved line about two-thirds up to the upper edge of the tear in the median line, and then down and out at the corresponding point on the right side. In order to avoid including the rectum, the left index-finger should be inserted into it and used for guiding the point of the needle. The finger should then be washed off with an antiseptic solution and the two ends of the suture held together with an artery-forceps and dropped. The second needle is inserted between the middle and the anterior third of the edge of the wound, at the same distance as before, and carried to the point between the inner and the middle portion of the upper edge of the wound. Here it is pushed out and carried over to the corresponding point on the right side, where it is again inserted and carried under the right triangle and out through the skin at the point corresponding to the point of entrance on the left side. Finally, the third needle is introduced a quarter of an inch outside of the foremost end of the tear, and carried under the torn surface to the point between the outer and the middle portion of the upper edge of the wound. Here it is pushed out, carried over to the corresponding point on the right side, under the right triangle and out a quarter of an inch outside of the upper end of the tear.

FIG. 398.

Transverse cut through knee-bandage.

Considerable tissue should be embraced by the sutures, so as to avoid their cutting through. When all the sutures are in place, the tampon is withdrawn, the surface is cleaned, and the sutures are closed from behind forward. They are left in place for a week.

The knees are tied together so as to prevent the patient from separating the thighs so much as to exercise a strain on the sutures. But for this purpose it is by no means necessary that the knees should touch each other, which is very annoying for the patient. A piece of muslin about six or eight inches wide is carried around one knee and fastened with two safety-pins. Then eight inches are left free, and finally the other knee is encircled in the same way (Fig. 229, 4). A cut through the bandage from side to side would have the shape of a pair of eyeglasses (Fig. 398). In order to prevent the knee-bandage from sliding down, it is well to fasten it to the abdominal binder on each side with a narrow piece of muslin, so-called *suspenders* (Fig. 229, 5, p. 202). The bowels are kept loose with castor oil (ʒii to iv—from 8 to 15 grammes—daily) or Hunyádi Janos water (℥iv to vi—from 120 to 180 grammes), and the patient is mainly kept on animal diet so as not to have too much residuum to be expelled through the anus.

As a rule, there is not much hemorrhage from the torn perineal body, and it is perfectly arrested by the application of the two halves of the wounded surface against each other. If an artery is seen spurting, it may be seized and tied with thin catgut, or circumvented with thread and needle. Even if the wound is somewhat jagged, the irregularities in the tear correspond to each other and grow easily together. Only long, loose shreds with a narrow pedicle should be cut off before uniting the wound. Instead of the three silkworm-gut sutures which I recommend, some prefer a running suture with catgut.

If the tear extends into the rectum, it is particularly advisable to unite the torn surfaces immediately after the birth of the child. Even if there should remain a rectovaginal fistula, the parts keep their shape and remain in a much better condition for a future plastic operation. In this case a triangular row of sutures should be inserted. One row is tied in the rectum. It should be of thin silk, put in rather superficially and left to be expelled with the fæces. It is best to attach a needle to each end of the thread and push both needles from the wound to the rectum, so as to avoid carrying septic material from the gut into the stitch canals. A second deeper row is put in from the vagina and tied there. For these catgut is preferable, which need not be removed. Finally, a couple of sutures are placed on the skin surface of the perineum. In this locality silkworm gut is the best.

The primary perineorrhaphy, when the parts are properly adjusted and antiseptic precautions are taken, almost invariably results in healing by first intention.

Delayed Suturing.—If the genitals are œdematous, or the patient is much exhausted, or for some reason or other the sutures cannot be put in immediately, suturing may be put off till the next day, and even much later,—up to the eleventh day, and perhaps still later. After granulation is established, the wound may still be united by suture and grow together, but then it is best to scrape the wound with the edge of a scalpel, so as to have fresh bleeding surfaces.

Tears near the Clitoris.—Tears near the clitoris have repeatedly led to a fatal issue, and ought, therefore, to receive adequate attention. What makes them so dangerous is that the pelvic veins all communicate and have no valves. A small wound may, therefore, become the source of a hemorrhage that may exhaust the vital force of the patient. The hemorrhage may, however, be checked by passing a ligature under the bleeding point and tying it (circumvention) or by tamponing the vulva.

§ 6. **Rupture of the Spleen, Heart, Blood-vessels, and Psoas Muscle.**—Several cases of rupture of the spleen have been reported. They occurred during pregnancy, during labor, or shortly after the same, and ended in sudden death. The autopsy showed the presence of an enormous spleen, a rupture in the same, and extravasation of a large amount of blood into the abdominal cavity. The spleen was enlarged by malaria, leucocythæmia, typhoid fever, etc., and gave way under the impulse of a trauma or a physical exertion.

The ascending aorta, the splenic artery, the epigastric artery, and a large abdominal vein have ruptured, either spontaneously or in consequence of an injury, and caused sudden death during pregnancy or labor.

In another case the psoas muscle had ruptured during the efforts of labor.

CHAPTER XIV.

SEPARATION OF ARTICULATIONS.

The joints of the pelvis may rupture during the strain of labor. That most frequently giving way is the *symphysis pubis.* The accident is most likely to take place in pelves which are generally contracted or narrow from side to side. The common cause is undue force in forceps delivery. Accoucheurs who have more brawn than brain are apt to attempt the impossible in trying to drag by brutal force a head through a canal that is proportionally too narrow for its passage. But cases have also occurred in spontaneous deliveries, and one case is even on record in which the child was born in the membranes and still the symphysis ruptured. Under such circumstances there must doubtless have been a previous weakness of the tissues composing the joint. The writer has never seen a case of scission of the pubic symphysis, and in the largest lying-in institutions of Vienna and Paris this injury has occurred only once in many thousand cases; but it is said to be not very rare.

The *symptoms* are marked enough to make a *diagnosis*, even when there is no palpable diastasis between the ends of the pubic bones. The patient feels severe pain in the joint, which also is extremely sensitive to pressure. At the time of the separation a cracking sound may be heard. The legs roll outside. The patient cannot move them, and passive movements elicit great pain. If there is a complete disjunction, the separation between the bones is felt. Sometimes the accident is complicated by a tear in the vagina, through which the finger can be put in direct contact with the disrupted joint. The bladder, the urethra, and the crus of the clitoris may be torn, and even without such injuries there is commonly found dysuria, such as incontinence, retention, or cystitis.

With proper treatment the prognosis is good, but when neglected the injury to the joint is apt to lead to suppuration, which is accompanied by a high mortality through pyæmia and osteomyelitis.

As a rule, complete union is obtained in from two to four weeks; and even if the union is only fibrous the patient may walk, but then the gait is more or less waddling.

Treatment.—The bones forming the articulation should be replaced and kept immobile by broad straps of adhesive plaster surrounding the whole pelvis, as after symphyseotomy. Complicating wounds should be united by suture.

Next to the symphysis pubis the *iliosacral joint* is the one that is exposed to rupture. In fact, the former, if the diastasis between the bones becomes too great, leads to the latter, the ligaments in front of the articulation rupturing under the strain to which they are put.

Even when this articulation does not rupture, the separation of the symphysis allows a rotatory movement of the auricular surfaces against each other, by which the inclination of the pelvis is increased and the true conjugate lengthened, conditions we shall come back to in speaking of labor in the dependent position and the operation of symphyseotomy.

The separation of the *sacrococcygeal joint* has also been observed. This may become the cause of a chronic inflammation of the articulation with coccygodynia. The bone should be replaced, a lead and opium wash applied outside, and suppositories with iodoform (gr. v t. i. d.) used in the rectum.

CHAPTER XV.

FRACTURES.

FRACTURES of bones in the pelvis or other parts of the body in consequence of labor are rare accidents. A case has been reported of a double fracture of the ascending and the descending ramus of the *pubis*. The patient recovered.

The fractured bones should be set and the pelvis immobilized with broad straps of adhesive plaster.

Somewhat more frequently the *os coccygis* breaks. The articulation with the sacrum may be ankylosed and the fracture occur there, or it may be found in the bone itself, the vertebræ of which normally become ankylosed in the middle of life. This little fracture may heal in a wrong position and become the starting-point of coccygodynia. The accident ought to be treated like the rupture of the sacrococcygeal joint.

A few cases of fracture of the *sternum* in consequence of the violent muscular contractions during labor have been placed on record. The fracture is transverse, and mostly situated in the manubrium. At the moment of the accident the patient feels the solution of continuity that takes place and a cracking sound is heard. There are pain in the chest, mobility of the fragments, and crepitus. There is also a change in the shape of the bone, the superior fragment projecting forward, while the inferior is depressed. The pain is much increased by any movement and by the efforts of coughing. Respiratory movements are shallow and frequent. The accident has ended fatally in several instances.

The *treatment* consists in setting the fracture and immobilizing the chest with a bandage, either plaster of Paris or a splint made of felt or wood-pulp. The delivery should be terminated as soon as possible according to general rules.

No case of fracture of the *ribs* during labor is known, but these bones have fractured spontaneously in a few pregnant women, especially during cough. A peculiarity of these and all other fractures during gravidity is the slowness of the healing process, which, doubtless, is due to the phosphate of calcium going to build up the skeleton of the fœtus. It is, therefore, advisable to give phosphorus internally, while the fracture is treated in the usual way with rest and a bandage.

CHAPTER XVI.

SUDDEN DEATH OF THE MOTHER.

During pregnancy a woman may be killed or die more or less suddenly in consequence of one of the many diseases which may complicate that condition. Death may also occur during labor before the child is born, or during the puerperal state.

A distinction may be made between a *rapid* death, where the life of the patient is extinguished in a few hours, and a strictly *sudden* death, which snatches the patient away almost instantaneously and without warning. A woman may bleed to death, for instance, from placenta prævia, or die in a few minutes from post-partum hemorrhage; or her nerve force may be exhausted by a tedious labor or eclampsia. Her uterus may rupture, and she may die from the combined action of shock and hemorrhage. In all such cases the accoucheur sees the gravity of the situation, he has time to do something to avert the impending blow, and he may even succeed in his efforts to save the patient's life. But there are other cases in which the patient succumbs as if struck by lightning,—a most terrific situation both for the medical attendant and for the friends of the patient. Some such cases were due to the rupture of a cerebral vein with apoplexy. In others death was caused by endocarditis, an embolus being detached from the heart and lodging in a cerebral artery, or by acute myocarditis. In others, again, the sudden death was brought about by entrance of air into the veins.

Sometimes the heart, previously diseased, or an aneurism of the aorta, or the diaphragm has ruptured in consequence of the efforts to expel the fœtus. A pericardial exudation may paralyze the heart. The sudden diminution in the blood-pressure within the abdominal organs which takes place when the fœtus is expelled is accompanied by a rush of blood to these parts and a corresponding anæmia of the brain, which may cause syncope and death. Hence the importance of keeping the patient in the recumbent position. Great pain, loss of blood, and protracted labor may exhaust the patient and end in sudden death.

In some cases even the autopsy fails to divulge the secret of the cause of death. Nothing is found to explain it.

During the puerperal state sudden death may be occasioned by embolism of the pulmonary artery. The offending body may be torn off from a thrombus during the act of friction with an ointment, or it may be detached spontaneously by a movement of the patient, especially in bending down to pick something up from the floor. The starting-point is a thrombus of the femoral, the uterine, or the ovarian veins, or the vena cava. As a rule, one of the chief trunks of the pulmonary artery is suddenly obstructed, causing violent dyspnœa, cyanosis, and almost immediate death. In more fortunate cases only a smaller branch is obstructed, when the dyspnœa and cyanosis are more moderate and recovery is possible.

In such cases of venous obstruction, especially phlegmasia alba dolens, there may be no warning sign of impending danger; in others the thrombus may irritate the vein and cause phlebitis with rise in temperature and increase of the frequency of the pulsation.

Sudden emotions of joy, sorrow, or fright may cause instant death.

Puerperal infection may also take so acute a form that it kills in less than twenty-four hours.

In some cases sudden or rapid death is due to a faulty use of antiseptic drugs. An assistant of mine, in introducing the intra-uterine tube, perforated the wall of the cervical canal and injected a one-to-two-thousand solution of bichloride of mercury into the peritoneal cavity. Another, in order to wash out the uterus with a one per cent. solution of carbolic acid, used a double-current catheter, but connected the afferent tube with the wide metal tube of the catheter instead of with the narrow. The autopsy showed that the uterus, which in consequence of dissecting metritis had become very thin in some places, had been ruptured, allowing the fluid to enter the peritoneal cavity.

Corrosive sublimate is so dangerous in puerperal women that it should not be used at all for vaginal or intra-uterine injections. In 1889 the writer collected twenty fatal cases due to this drug in obstetric practice alone and added two observed by himself.[1]

Carbolic acid has also caused rapid death by absorption. It should not be used in stronger solution than two per cent. in the uterus and vagina.

CHAPTER XVII.

CHILDBIRTH AFTER THE DEATH OF THE MOTHER.

Somatic death is not an instantaneous event. Death is a gradual process. Even in a case of sudden death one literally dies by inches.[2] A headless chicken may be seen running about in a barnyard. If one chops off the head of a calf, for several minutes the severed head will show signs of difficult breathing. If the tip of a finger be brought close to the eye, the eye will wink, just as does that of a live animal. If the cavity of the chest be opened, the heart will be seen to continue to contract and relax for a long time. One may even cut out the heart altogether and place it under a glass shade, and still its rhythmic movements continue. This life of the organs is shown still more impressively by opening the carotid in a dog and letting him bleed to death. There comes a moment when the dog dies, and life would remain extinct if the animal was left to himself. But if the severed vessel be tied and blood from another dog be injected, the dead dog will return to life and may continue living as long and in as perfect health as if he had not been subjected to any experimentation. This is due to the life remaining in the tissues which enables them, under the impulse of fresh blood, to resume all the suspended vital functions.

The writer has seen the ciliated epithelium in the interior of an ovarian tumor of a woman in full movement the day after its extirpation.

---

[1] Garrigues, "Corrosive Sublimate and Creolin in Obstetric Practice," Amer. Jour. Med. Sci., August, 1889.

[2] Garrigues, "The Legislation needed in Regard to Apparent Death," Med. News, April 14, 1900.

There is, therefore, nothing remarkable in the fact that a child may be born after the death of its mother, if by her death we understand that respiration has stopped and the heart has ceased beating. The uterus retains its power of contractility, and may expel the fœtus dead or alive. As a rule, in such cases the mother is exhausted by previous illness or the pangs of a protracted labor, and then the fœtus will soon die undelivered, from asphyxia. To be born alive it must leave the maternal body within a few minutes, probably at most within a quarter of an hour. In the great majority of cases of spontaneous births after the death of the mother the child was dead.

But the case is quite different if a pregnant woman at term or in actual normal labor is suddenly killed. Under such circumstances a living child has been removed from its mother's body by Cæsarean section one and even two hours after her death.

From the old Romans a law has been inherited and incorporated in the statutes of most countries to the effect that when a pregnant woman dies, and the child is alive, it shall be the duty of the attending physician to perform Cæsarean section at once, with the aim of saving the life of the fœtus. This seemingly humane law is, however, beset with difficulties in its practical application. The distinction between real and apparent death being a most delicate matter, it has happened more than once that the supposed dead woman, under the stimulus of the pain inflicted by the surgeon's knife, returned to life, to the dismay of the operator and the horror of her friends. It may, therefore, be laid down as a rule that it is not safe to perform Cæsarean section otherwise than according to the rules of surgery. I do not mean that the accoucheur should take the time to provide for an aseptic and antiseptic operation, as he would and should under ordinary circumstances, but the necessary material and implements for uniting the wounds in the uterus and the abdominal wall should be present.

The value of the operation cannot be doubted. Puech found that in 453 post-mortem Cæsarean sections the child showed signs of life in 101 cases and continued to live in 43 cases.

Since the life of the fœtus is extinct so soon after the mother's death, the proposition has been made not to wait for her death, but to operate while she is dying. If great interests were at stake, and the dying woman herself desired to have the operation performed, this might be considered; but under ordinary circumstances I think the physician should be guided by the rules that the mother is a really existing human being, while the child, until it is born, is only a possibility, and that it is his duty to prolong life. Now, there cannot be any doubt that when a woman's life is ebbing away the infliction of the wounds necessary for the performance of Cæsarean section will hasten her death, and still môre the administration of an anæsthetic, if such is used. It would be especially unjustifiable and revolting to exercise any kind of pressure to induce the dying woman to give her consent to the operation.

If the os is well dilated, the pelvis normal, and the fœtus of average size, it may be possible to turn the fœtus and extract it manually in as short time as that required for Cæsarean section, or if the head is already engaged a forceps operation may also be successful.

Some go so far as to think that even if the fœtus is dead it should be extracted from the maternal body, either *per vias naturales* or by Cæsarean section. The only real advantage the writer sees in performing this post-mortem would be to avoid the possible spontaneous expulsion of the child, which might give rise to the belief that the woman was not dead and was deserted by the attendant accoucheur. Such expulsion from the dead body of the mother may, indeed, take place days after death has occurred, and is then no longer a vital process, but simply an effect of the mechanical pressure exercised on the fundus uteri by the development of gas in the abdominal cavity in consequence of putrefaction. While the vital process of uterine contraction stops soon after death, the chemical function of putrefaction, ushered in by microbic invasion, begins later and goes on till the abdominal wall ruptures. To this category belong the cases in which, on reopening coffins, a dead child was found lying outside of a dead mother.

CHAPTER XVIII.

INJURY TO THE FŒTUS DURING LABOR.

SERIOUS lesions of the fœtus, such as fractures of the cranial bones, the cervical vertebræ, the collar-bone, the humerus, the lower jaw, and paralysis of the upper extremities, occur most frequently in cases of narrow pelves (pp. 460, 462). They may either be spontaneous or be due to operative manipulations. In the latter case they are sometimes unavoidable, but much more frequently they are produced by lack of skill and cautiousness on the part of the obstetrician. Thus the skin may be scratched. The eyes are particularly exposed in face presentations and in delivery by pressure from the rectum. In breech presentations the anus and genitals may be wounded. The worst the writer has seen in this line was a case of pelvic presentation of a female child, in which the attending physician, in trying to apply the forceps to what he took to be the head, inserted one blade into the pelvis of the fœtus and tore the genitals and intestine to pieces.

In breech presentations injuries to the soft parts of the groin are not rare. They are due to pressure with the fingers, the fillet, or the blunt hook (pp. 387–389).

Rough manipulation of the abdomen during extraction has led to rupture of the liver and to hemorrhage in the suprarenal capsule. Too violent movements in reviving asphyxiated children by Schultze's method have also led to such hemorrhage and even to avulsion of the spleen.

In forceps extractions a blade may press so much on the facial nerve on one side that the child is born with a paralysis of one side of the face. This, however, is a transient lesion, which passes off in a week or two without treatment.

Some conditions demand a more detailed description in this place.

§ 1. **Cephalæmatoma.** — Cephalæmatoma is an extravasation of blood between the periosteum and the bones of the cranium. It forms a globular or ovoid fluctuating tumor and is always limited to the contour of a bone, the periosteum being so tightly adherent to the edges of the bones that the blood cannot pass this barrier.

Diagnosis.—This limitation within the edges of a bone and the fluctuation distinguish cephalæmatoma from *caput succedaneum*, which, situated between the periosteum and the scalp, can spread in all directions, and gives a doughy sensation, the blood and serum filling the meshes of the subcutaneous connective tissue.

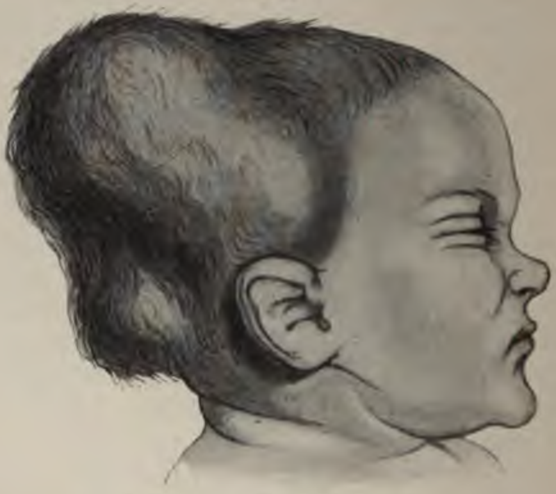
The cephalæmatoma may be limited to one bone or found on two, three, and even four bones simultaneously (Fig. 399). It is most common on the anterior parietal bone, but is found also on the posterior parietal, the frontal, and the occipital bones.

The blood is fluid and dark. The swelling increases during the first week after birth, when involution begins. In the circumference a ring of callus is formed and felt as a hard bony mass, in comparison to which the soft centre makes the impression of a hole. In most cases the blood and callus are slowly reabsorbed, and finally the swelling totally disappears, but this process of involution may take three or four months. In rare cases the bone formation continues, and a parchment-like roof is formed over the blood, which on pressure emits a crepitus-like sound. This process of ossification may go still farther and result in an exostosis. In other cases the contents of the swelling may become purulent.

Etiology.—The chief cause, as in caput succedaneum, is doubtless pressure, and the two affections are often combined, the cephalæmatoma being concealed the first days by the more superficial and widespread caput succedaneum. Autopsies have also shown that below the caput succedaneum may be found small cephalæmatomas which had not the requisite dimensions to make themselves clinically known.

Cephalæmatoma is much more common in primiparæ than in women who have borne children before, and therefore offer less resistance to the passage of the fœtus. A narrow pelvis predisposes to it. It may be due to pressure with the forceps or to manual extraction. The bleeding is caused by a detachment of the periosteum, which membrane is being pushed aside by pressure, especially against the pubic arch or the promontory. In other cases there is formed a fissure in the bone, and then the blood may not only collect on the outer surface of the bone, but also inside, between the bone and the dura mater,—*internal cephalæmatoma*.

FIG. 399.



Double cephalæmatoma. (Ahlfeld.)

The extravasation may also be due to intra-uterine asphyxia, with the concomitant congestion of the head of the fœtus, and abnormal fluidity of the blood, and it may therefore be found in small children and where there was no obstruction in the maternal parts. It has been seen combined with bleeding from the genitals or melæna, which conditions were also referable to internal stasis of blood and rupture of vessels in the mucosa of the uterus or the intestine.

The author has observed a case in which the child, who was of the male sex, later appeared to be suffering from hæmophilia. A common little knock would cause large subcutaneous extravasations. These being in different degrees of absorption, his body was not unlike a colored map, and he came near losing his life once for having a milk-tooth pulled.

Treatment.—Small cephalæmatomas may be left untouched. In larger ones the process of repair may be much expedited and the formation of an exostosis prevented by evacuating the tumor with an aspirator or small incision, followed by compression with straps of rubber adhesive plaster. Before making any wound the skin should be shaved and disinfected with bichloride and alcohol.

If an abscess forms, which may be inferred when the swelling becomes red, hot, and painful, and the child has fever, it should be opened and drained, as otherwise it might lead to meningitis.

§ 2. **Asphyxia.**—Originally meaning pulselessness, the word asphyxia nowadays means a condition of impeded or suspended respiration. Normally the fœtus, while in its mother's body, is in a state of *apnœa*,—that is to say, its blood being oxygenated in the placenta, it has no desire for air and does not attempt to breathe. But as soon as anything interferes with the uteroplacental circulation, the supply of oxygen becomes insufficient, effete matter accumulates in the fetal blood, and, in consequence of irritation of the medulla, the fœtus attempts to breathe. The thorax is expanded and works like a pump, but, since there is no air in the uterus, the fœtus cannot breathe; it is in the condition called *asphyxia*. This may be intra-uterine or persist after the birth of the child.

INTRA-UTERINE ASPHYXIA.—This may be due to the mother's death or loss of blood, or to diseases that diminish the oxygen circulating in the maternal body,—for instance, pneumonia or eclampsia; to premature detachment of the placenta, especially placenta prævia, more rarely of a normally inserted placenta; to compression of the umbilical cord; or to diseased conditions of the placenta, by which the area of exchange between maternal and fetal blood becomes restricted beyond the physiological limits which are found in every case of pregnancy (p. 129). It may also be brought about by tetanic contraction of the uterus, in which the normal intervals between uterine contractions do not occur. Indirectly it may therefore be due to the administration of ergot.

Asphyxia may arise also in consequence of pressure on the fetal head. A narrow pelvis or too large a size of the fœtus may therefore become a predisposing cause of asphyxia, whether the woman delivers herself or the fœtus is extracted manually or by means of forceps. The compression of the head irritates, indeed, the pneumogastric nerve, which retards and finally arrests the contraction of the fetal heart. The compression of the head may also fracture the bones of the skull and cause intracranial extravasation of blood. On the hemispheres this may be well borne and the blood may be reabsorbed, but on the base of the brain such extravasation is very dangerous.

The expansion of the thorax produces a dilatation of the right ventricle, which in the normal condition pushes a large current of blood through the duct of Botallo and the descending aorta and its branches to the placenta. Also in this way the attempt at breathing contributes to interference with the free circulation in the placenta.

The immediate effect of the expansion of the chest is that the liquids with which the mouth of the fœtus is in contact—liquor amnii, mucus, blood, meconium—are sucked into the air-passages, where they are found at the autopsy on children who died asphyxiated. If, however, the mouth and nostrils are in contact with the wall of the parturient canal, this aspiration of foreign substances cannot take place, and they are not found in the air-passages after the death of the child.

Another effect of the premature expansion is attraction of blood to all the thoracic organs, which leads to the rupture of the fine blood-vessels. In the living asphyctic child there is often found bloody mucus in the trachea, and, while this blood may have been aspirated from the genital tract of the mother, or may come from wounds inflicted by the obstetrician in his endeavors to save the child's life, part of it may come also from ruptured capillaries in the mucous membrane of the fetal air-passages themselves. At the autopsy on children who died from asphyxia are also constantly found ecchymoses under the pleura and the pericardium, and the lungs are found in a high state of congestion.

Clinically, there are well-marked signs which warn the physician of the peril in which the unborn child is placed. Sometimes the fœtus makes at first unusually violent movements, which can be seen and felt, but this is only a transition to the opposite condition of slow movements followed by the immobility of death. As a rule, the pulsations of the heart become much slower. Normally the heart-sounds become slower during uterine contractions, but this retardation is comparatively insignificant, and is equalized by a faster rhythm in the interval between labor-pains. When the heart-beat drops to 100 per minute, the life of the fœtus is in danger. If the umbilical cord is within reach, the corresponding retardation of pulsation is felt there.

Exceptionally, the heart-beat, instead of being retarded, is much increased in frequency, even up to 200 beats in a minute. This is particularly observed in cases of sudden impaction of the head in a narrow pelvis, and the explanation of the occurrence is probably to be sought in the suddenness and vigor of the compression of the head, which paralyzes the pneumogastric nerve instead of stimulating it.

Another sign of asphyxia is the expulsion of meconium. If the fœtus is in head or transverse presentation, the admixture of meconium to the liquor amnii is a sign of some importance, but even then the child may be born in good condition. The explanation of this is probably that the child at a time was asphyctic and that the disturbing element was eliminated. In pelvic presentation the expulsion of meconium has much less value, since it may be due to simple mechanical pressure on the abdomen of the fœtus. Quinine given to the mother during labor also causes the meconium to be expelled.

If the hand of the accoucheur is introduced into the uterus, he may directly feel the respiratory movements of the fœtus. He may likewise through the perineum or rectum feel the mouth open. In manual extraction we may see the movements of the thorax and abdomen, while the head is still in the pelvis.

The asphyxia produces a general lack of tonus, which shows itself in the expulsion of the meconium and the urine, in prolapse of extremities, and in brow and face presentations.

In rare cases the fœtus may even be heard to cry in the uterus,—so-called *vagitus uterinus.* This is only possible when air in some manner finds its way into the uterus,—for instance, alongside of the hand or instruments that are introduced through the vagina. The asphyctic fœtus then inhales this air and expels it again, whereby the sound is produced.

Intra-uterine asphyxia is a dangerous condition that frequently leads to death, and, therefore, often calls for the interference of the physician in order to save the life of the fœtus. This may be done by forceps if the head is engaged, or by extraction if it is still above the brim, either of which operations should be performed only after obliteration of the cervix and full dilatation of the os.

Asphyxia after Birth.—If the child does not breathe promptly after having been born, it is said to be asphyctic, but this asphyxia may be so slight that it is of little importance and would soon cease spontaneously; or, again, it may be so deep that it is impossible to make the child breathe, or that, even if it survives temporarily, it dies within a few days.

Cases of asphyxia after birth present great medicolegal interest,[1] and the history of medicine bears testimony that even great obstetricians have shown a remarkable lack of appreciation of what constitutes life. The laws of different countries also vary considerably in their determination of what constitutes a *living child.* A double interest attaches to the question: on the one hand, the criminality of maltreating the child; on the other hand, its capability of inheriting and transmitting property. The Roman law required that it should be perfectly alive, but it needed not to make its voice heard. In France the law requires that the child shall be born viable, and the interpretation of the terms *life* and *born alive* is complete and perfect respiration. According to Scotch law the child must cry. The English law is much more in accordance with medical science. "Crying," says Blackstone, "is the strongest evidence of life, but it is not the only evidence." Coke says, "Crying is but a proof that the child was born alive, and so is motion, stirring, and the like." Dunlope laid down the right principle that, where there is power of being affected by stimuli other than electric, this, in common sense, must be held to constitute vitality.

---

[1] Garrigues, "Asphyxia in New-born Children considered from a Medical and a Legal Stand-point," Amer. Jour. Obstet., vol. xi., No. 4, October, 1878.

In several cases of alleged infanticide the English judges, in charging the jury, said that a child may be born alive and live for some time without breathing. In fact, it would appear that breathing is regarded as only one proof of life, and the law will receive any other evidence which may satisfactorily show that a child has lived. A child that is born alive, or has come *entirely* into the world in a living state, may, by English law, inherit and transmit property to its heirs, even although its death has immediately and, from morbid causes, perhaps necessarily followed its birth. The mere warmth of the body is not enough to be evidence of life; but the slightest trace of vital action, in its common and true physiological acceptation—such as crying, breathing, pulsation, or motion, be it only the twitching of an eyelid,—observed after entire separation from the mother, without regard to cord and placenta, would be deemed in English law a sufficient proof of the child having come into the world alive. But the reader should notice that in the eyes of the law the child is not born until every part of its body is outside of the maternal body. The writer has, therefore, made it a rule always to extract even the tips of the toes from the genital canal when the trunk has been expelled. If a case of this kind should come up in this country, the decisions of the English courts in similar cases would be considered the law. As practitioners we should use every effort to make the child cry, this being, to the popular mind, the convincing proof of its being alive, which will, perhaps, save the trouble and expense of a lawsuit, and which also gives hope of keeping it alive; but as expert witnesses we must remember that life may be manifested in many other ways. As long as active motion goes on,—such as pulsation felt or heard in the heart, pulsation in the cord after the child has been entirely expelled or extracted from the mother's body, the faintest respiratory gasp, or a movement of the lips, of an eyelid, or of a limb,—life is not extinct. Any maltreatment of the child is a crime, and it has the right of inheriting and transmitting property.

The asphyctic child may present two very different appearances, which are of great importance as to prognosis and treatment. The child may either be purple and turgid or pale, wax-like, and limp. In the *purple* variety the outlook for its recovery and continuance of life is much more promising than in the *pale* variety. Even if we succeed in making the child cry, it often dies within a few days. This may be due to a deglutition pneumonia or general sepsis caused by the foreign bodies which have been drawn into the lungs. Or larger lumps may block up a bronchus and prevent air from entering the alveoli—so-called *atelectasis*.

Besides the color, there are other signs by which slight asphyxia may be distinguished from deep. If the little finger is introduced into the throat, the faucial muscles in light and middling degrees of asphyxia grasp it, while in deep asphyxia no such movement is elicited, and the lower jaw falls down. If the frequency of the heart-beat is increased in a marked degree by cutaneous irritation, the outlook is also good. Cases have even been reported in which there were no audible heart-sounds, and still the child was revived. Ahlfeld has had four cases in which there was respiration, but no trace of heart-sounds. It is therefore better, in cases of apparent death of the child, unless there is positive proof of its real death, to try to revive it.

Treatment.—In the author's experience one of the most effective means of making the child cry is to immerse its whole body, except the head, alternately into very warm and ice-cold water. I therefore always direct the people to have plenty of hot water, ice, and two vessels large enough to dip the child in. The water should be so hot that the accoucheur can just hold his hands in it (about 110° F.). In winter-time the water as it flows from the hydrant is cold enough, and still the direct rubbing of the abdomen with a lump of ice has proved useful in my hands. A baby bath-tub is very convenient, but a foot-bath-tub, a wash-tub, a dish-pan, or large basin will do. The child should always first be placed in the hot water, as this draws the blood away from the congested lungs and brain to the capillaries of the skin. It should also be held twice as long in the hot water as in the cold, in which it remains only a few seconds. While it is in the water the skin of the trunk and extremities should be rubbed rather roughly. The first cry comes invariably while the child is in the cold water. After that it is taken out, rubbed well with warm cloths, and dressed.

If the immersion in hot and in cold water and rubbing do not act promptly, I slap the child on the buttocks, and if that does not make it cry, I resort to B. S. Schultze's swingings (Figs. 400, 401). For this purpose the child is held a little in front of the accoucheur, its back turned towards him. He places his thumbs in front of the shoulders and the fingers behind, the index-finger resting in the axilla. The child's body hangs down. The head is supported between the accoucheur's wrists, so as to prevent it from falling forward and backward. Next, a movement is imparted to the child's body by which it is doubled up, the buttocks forming the highest point and the legs hanging down between the head and the accoucheur. Then the movement is reversed, so that the child again is made to hang down, and so forth. These movements should by no means be violent, nor should they be repeated in too rapid succession; from ten to fifteen times a minute is enough, and the movement should not be stronger than just what is needed to produce the change in posture of the child. In the stretched position the thoracic cavity is enlarged and air is aspirated. In the doubled-up posture, the thorax is forcibly compressed in imitation of a forced expiration. Schultze claims that this expiration suffices even to expel the liquids that have been drawn into the lungs, but that is not always so. These swingings may be repeated many times. Some report to have repeated them fifty times, others even six hundred times. I have never approached such vigorous treatment. When I

FIG. 400.

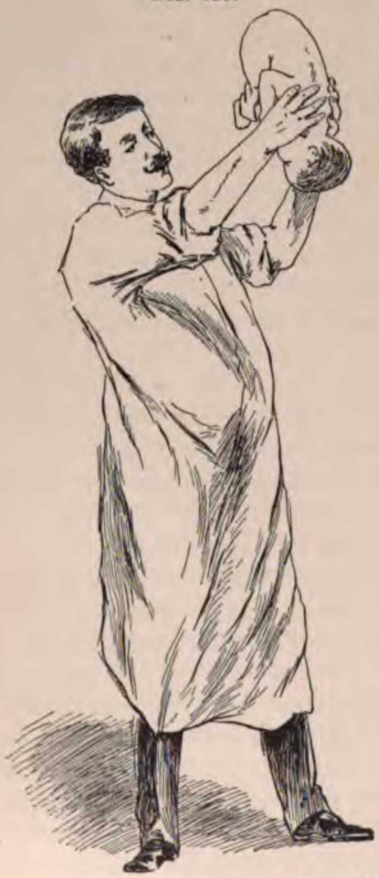
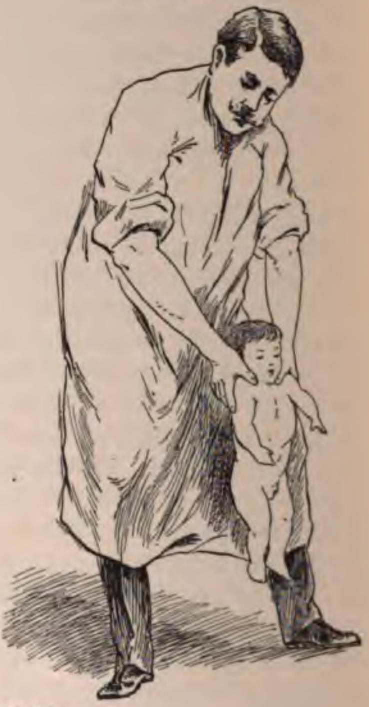


FIG. 401.



B. S. Schultze's swingings.

have swung the child a few times, I repeat the hot and cold bath, then again make swingings, and so forth. But if I do not soon see an improvement in the child's condition, I discontinue these means, wrap the child in warm cloths, and use the larynx catheter.

Many severe injuries have been reported in consequence of the Schultze method; but I am inclined to think that it was not the method, but the accoucheur, which was at fault. The collar-bone and ribs have been broken and the ends made to wound the lungs. Hemorrhage has occurred in the suprarenal capsules, and the liver has ruptured. Even the whole spleen, which was enlarged, has been torn off completely and found lying loose in the blood-filled abdominal cavity.

If the aspirated fluids are heard producing râles in the trachea and bronchi and are not expelled by Schultze movements, an elastic catheter (but not one of soft rubber) should be introduced into the larynx. It should be of medium size,—about No. 9 French. The child lies, warmly wrapped up, on its back. The accoucheur inserts his left index-finger and lifts the epiglottis with it. Next, he slides the catheter, which should be lubricated with white vaseline, along the finger into the trachea and down to the bifurcation. Then he applies his mouth to the upper end of the catheter and makes suction while he slowly withdraws the catheter. If necessary, he repeats this procedure until all mucus, blood, meconium, and liquor amnii have been removed. If only one side of the thorax expands, it is a sign that the bronchus of the other side is obstructed, and by turning the catheter in this direction the accoucheur may be able to free it from the obstructing substances.

If the child now breathes freely, nothing more is called for; but if it remains asphyctic, the catheter is again introduced and used for another purpose. Now the accoucheur no longer aspirates, but blows air into the trachea and bronchi. In order to avoid rupturing the alveoli and producing an emphysema, the air should be blown in with very little force; and, in order that the air may contain as much oxygen as possible, only air from the upper air-passages should be used. The air should only be propelled by movements of the cheeks, and not by using the expiratory muscles of the thorax. The author has used this method of insufflation frequently. He did not find it difficult to execute, and he has seen excellent results from it.

The *methods of Marshall Hall and Silvester* are of less value on account of the softness of the fetal bones and cartilages. Marshall Hall's method consists in simply turning the child alternately on the back and the side. Silvester's method consists in alternately stretching the arms up alongside of the head and pressing the elbows against the lower ribs.

Laborde's method—rhythmic pulling forward of the tongue—has been praised as effective when everything else had failed. I have no personal experience with it in new-born children, but in anæsthesia asphyxia in grown-up people it has seemed to me to be better than anything else.

Some practise insufflation simply by laying a cloth over the child's mouth and blowing through it. When I have tried this method, the air went into the stomach; and I prefer, therefore, the use of the catheter.

If a *faradic battery* is at hand, it should be used. Some look upon it as the best of all means to overcome asphyxia. One pole should be placed above the collar-bone, between the sternocleidomastoid and trapezius muscles. This is done in the hope of reaching the phrenic nerve. The other electrode should be placed at the edge of the ribs on the right side. The idea of this is to irritate the diaphragm to contraction and to avoid the heart. If the phrenic nerve is irritated it will make the diaphragm contract, and thus powerfully attract air into the lungs. But the pneumogastric nerve is found in the same cervical triangle, and the irritation of that nerve would make the heart-beats slower, and might thus do more harm than good. Maybe the favorable action in reality is only due to the powerful cutaneous irritation produced by the current. At all events the effect should be carefully watched.

Another way of expelling aspired substances from the lungs besides those mentioned above—Schultze swingings and aspiration—is to suspend the child by the feet and shake it.

In the pallid variety of asphyxia, when life is nearly extinct, all movements, especially the Schultze method, should be avoided, and recourse had to the warm bath, rubbing, insufflation, and electricity.

After deep asphyxia the child should be watched carefully for several days, in order to come to its assistance if needed. As a routine treatment, it is well to prescribe brandy and digitalis, 5 drops of the former and 1 drop of the tincture of the latter every 2 to 4 hours. It may also be useful to place the child in an incubator, and at all events it should be kept in an even, warm temperature by covering it well and placing hot-water bottles around it.

In the purple variety, some advise to bleed the child by letting half an ounce of blood escape before tying the navel-string, while others even wait several minutes before they tie the cord, with a view of giving the child most of the blood that is in the placenta. Personally, I neither do one nor the other. As to bloodletting, I think it is superfluous. The congested organs can be depleted by attraction to the skin. And when there is any danger of the child's life, especially in the pallid form, I take it to be more important to sever the child from the mother and begin the course of reviving measures described above.

When there is the slightest sign of life, especially heart-beat, or of improvement in the child's condition by treatment, we should continue our efforts to revive it fully. The writer has himself worked for two and a half hours on an asphyctic child before it made the first respiratory gasp, and others state also that children have been revived although they did not breathe for two or three hours.

§ 3. **The Avulsion of the Head of the Fœtus.**—The avulsion and retention of the fetal head in the cavity of the uterus constitutes one of the most serious complications of childbirth. Macerated or immature fœtuses are more liable to this injury than those who are full-born and alive.

Matthews Duncan found experimentally that the spine gave way at a traction of 105 pounds, and the head became totally severed from the body when the weight reached 120 pounds.

In most cases this accident is due to narrowness of the pelvis or to enlargement of the head, particularly from hydrocephalus. But frequently the event is attributable to errors on the part of the accoucheur, who in some cases was neither a physician nor a midwife, but the husband of the patient, or some other man or woman, sometimes several joining their forces in order to extract the child.

In regular obstetric practice, avulsion is most likely to happen during extraction after podalic version. If the chin is allowed to be hooked over the symphysis pubis, or if in occipito-anterior positions no means are used for making the head pass through the pelvis with favorable diameters, and then great force is used in hauling on the shoulders, the head cannot fail to be torn off. In the operation of decapitation in neglected transverse presentation, the head is on purpose severed from the body in order to accomplish delivery.

The head remaining in the uterus has been expelled by uterine contraction. It has suppurated and become disintegrated, or has given rise to general sepsis and death. The sharp edges of the bones have burrowed into the neighboring tissues, causing vesicovaginal and rectovaginal fistulæ.

The removal of the torn-off head has sometimes proved exceedingly difficult, even in the hands of the most experienced obstetricians. Special instruments have been devised for the purpose, all of which have proved more or less unsatisfactory. Delivery has been accomplished in the most different ways,—manual extraction, forceps, cephalotribe, cranioclast, symphyseotomy, Cæsarean section, amputation of the uterus, and removal of detached bones through the vagina, the rectum, or the abdominal wall.

The death-rate in these operations has been over twenty per cent.

In some cases it was due to rupture of the uterus, in others to hemorrhage without rupture, and in most to sepsis, in which respect it should, however, be noticed that most of these cases occurred in private practice, and without, or with insufficient, antiseptic precautions.

Treatment.—If there is no mechanical disproportion between the head and the pelvis, it may be possible to expel it by pressure from above, or to extract it manually by passing two fingers into the mouth and the thumb into the foramen magnum and taking care to conduct the mento-occipital diameter through the axis of the pelvis. If this does not soon succeed, the head should be pressed down, perforated, and extracted with cranioclast. If this instrument is not available, perhaps the head may be extracted with forceps after having been diminished by craniotomy. Great care should be taken to place the surroundings of the foramen magnum so that no sharp bones will wound the walls of the parturient canal during extraction.

In those cases in which the soft parts of the neck are still intact and the separation is limited to the spine, perforation may be made through the dorsal vertebræ and the brain broken up and washed out with a catheter, when the head may be extracted manually or with the forceps.

PART III.—OBSTETRIC OPERATIONS.

Several obstetric operations have already been fully described in connection with the conditions for which they are used. Thus the *removal of the placenta* by expression has been described under the management of normal labor (p. 196), and that by direct separation and extraction, in treating of the retention and adhesion of the placenta (p. 419). *Episiotomy* has been described in connection with means of preventing the laceration of the perineum (p. 541). *Enucleation* of the head by pressure through the rectum was referred to under the management of normal labor (p. 193), and more fully in speaking of the prophylactic treatment of laceration of the perineum (p. 541).

CHAPTER I.

TAMPONADE.

If tamponade is decided on, it should be effective. To put three or four pieces of cotton of the size of hen's eggs into the vagina in order to check a hemorrhage is nugatory. The blood will soon soak through and the patient be in the same danger as before. Iodoform gauze is too porous a material to form a reliable antihemorrhagic plug. I use it only in case there is a partial dilatation of the cervical canal. Then I fill this with iodoform gauze, for which purpose it is well adapted by its softness. A pledget of iodoform gauze may also be placed at the vault of the vagina, covering the os. But most of the vagina should be filled with pledgets of absorbent cotton wrung out of a one per cent. emulsion of creolin, which has both antiseptic and hæmostatic properties. For this purpose I take two squares of cotton of the full width as it comes from the factory in pound packages, that is to say about a foot. These are thoroughly immersed in the emulsion, wrung out, and torn lengthwise into shreds about two inches wide, which are folded until they form small flat squares. The patient should be placed in Sims's position and a Sims speculum introduced, exposing the os. After having removed all clots, washed the vagina with cotton dipped in creolin emulsion, and wiped the vagina dry, it is gradually filled, beginning at the top with one on either side of the cervix, one in front, and one behind, and pressing the pledgets with a strong dressing-forceps until the whole cavity is closely packed down to the entrance of the vagina. This tampon should not be left *in situ* longer than twenty-four hours, and should very exceptionally be renewed.

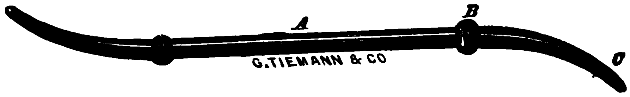
Before proceeding any farther, I would particularly warn against dipping the cotton used for the tampon in liquor ferri chloridi. Its removal costs the patient great pain, and I have seen an ulcer produced by it which took three weeks to heal. The liquor ferri chloridi is so strong a preparation that it should not be used on a tampon unless diluted with at least ten times as much water. I have also seen the whole vaginal epithelium come off in one piece like a finger-cot after the use of the injection of one teaspoonful to a pint of water. For injection the strength should not exceed half a teaspoonful to a pint, or about one per cent., most teaspoons holding nearly two fluidrachms (eight cubic centimetres).

CHAPTER II.

ARTIFICIAL DILATATION OF THE CERVIX DURING PREGNANCY.

To use tents for the dilatation of the cervix is not to be recommended, since it is very difficult, or next to impossible, to obtain them in an aseptic condition, and the process of imbibition is slow. Rapid dilatation by means of coniform, olive-shaped, and expanding dilators is much to be preferred. Hanks's dilators (Fig. 402) are usually made of hard rubber and lose their curvature if boiled. Instead, they may be disinfected by immersion for five minutes in a solution of bichloride of mercury (1 : 1000), lysol, or creolin (1 : 100), or they may be made of metal. They are numbered from 9 to 20, which numbers indicate the circumference in millimetres.

FIG. 402.

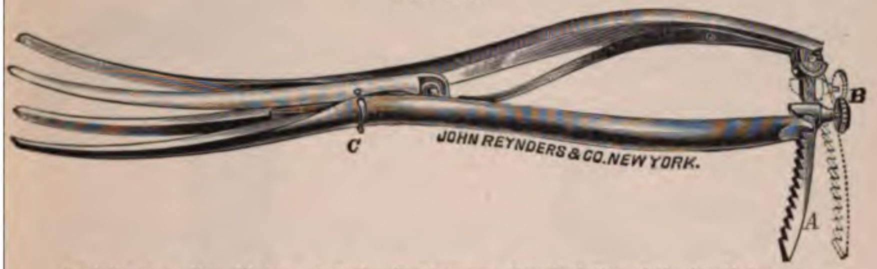


Hanks's cervical dilator. *A*, stem; *B*, shoulder; *C*, point.

When the coniform dilators meet with resistance, they are exchanged for the expanding instrument, working on the principle of a glove-stretcher,—that is, by lateral expansion effected by separating metal rods from one another. Of the numerous instruments of this class that of Goelet (Fig. 403) is particularly well adapted for abortion cases, on account of having four long and strong branches.

I have had a series of ten olive-shaped hard-rubber balls made measuring from 33 to 67 millimetres in circumference, and marked according to the American scale as Nos. 22, 25, 28, 31, 34, 37, 39, 41, 43, and 45. They can be screwed on an S-shaped metal shaft. The largest serves as a handle (Fig. 404). These olives give all the dilatation needed to introduce the index-finger and a large curette into the uterine cavity. If still more space is needed, as in premature labor, there is a similar set of ten balls devised by Hanks. They range from 73 to 137 millimetres in circumference, and cause sufficient dilatation for the passage of a large fœtus.

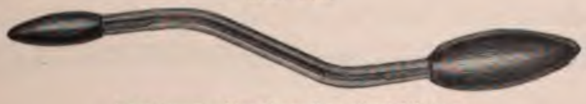
FIG. 403.



Goelet's expanding dilator. *A*, rack; *B*, set-screw; *C*, articulation of the fourth branch.

Modus Operandi.—The patient is placed in the dorsal position. In hospitals she is placed on a special operating-table, such as Edebohls's, Boldt's, or Cleveland's, which have attachments for lifting the feet up in stirrups. In private practice any stout table may be used, preferably a common kitchen table, measuring four feet in length and two in width. It should be covered with a folded quilt and a pillow for the head. To the quilt is pinned a sheet of rubber or enamel, an inexpensive kind of oil-cloth much used for table-covers. The lower flap of this cloth is pinned together so as to form a funnel leading to a slop-pail between the feet of the operator. On the top of the water-proof material comes a folded sheet, on which the patient lies, her buttocks protruding three or four inches from the end of the table. While she is being anæsthetized, her feet may rest on the seat of the chair later occupied by the obstetrician. When she is under the influence of the anæsthetic, her genitals are shaved and the abdomen disinfected with tinctura saponis viridis, bichloride of mercury, and alcohol, as described above (pp. 188, 190, 218). The vagina is disinfected by pouring the soap tincture into it and scrubbing it with cotton balls or gauze, using a copious amount of sterilized water, and, finally, lysol.

FIG. 404.

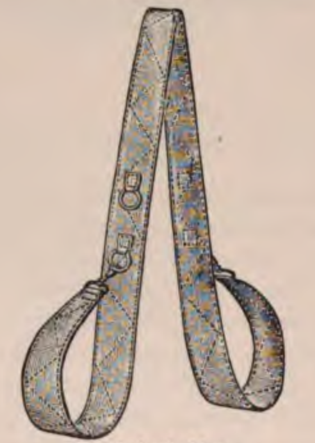


Garrigues's olive-shaped cervical dilators.

When the patient is properly anæsthetized, disinfected, and catheterized, her legs are forcibly bent in the hip-joints, so as to bring her knees high up towards the shoulders, in which position they are held by Robb's leg-holder (Fig. 405). It consists of a long, narrow band [illegible] with rings and snaps. It is easily rolled together and takes up little [illegible] space in the satchel. It surrounds the lower part of the thigh, passes [illegible] under the right shoulder and above the left, which is protected against pressure by a thick pad of cotton batting placed between it and the leg-holder.

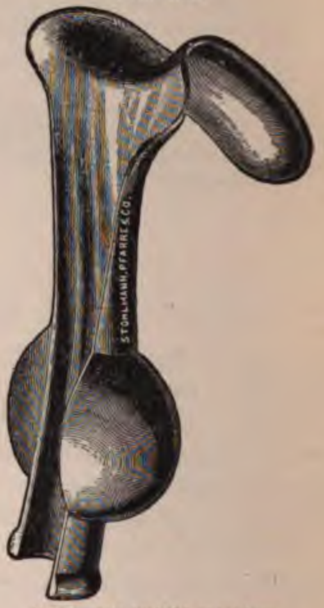
Next, Garrigues's self-holding weight speculum (Fig. 406) or a single-bladed Sims speculum is placed on the posterior wall of the vagina. An anterior blade or any kind of vaginal retractor may also be needed (Fig. 407). The cervical portion of the uterus is seized at the right side of the os with a bullet-forceps and pulled down to the vaginal entrance. In using the thicker

FIG. 405.



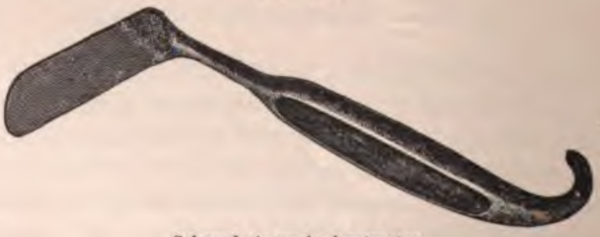
Robb's leg-holder.

FIG. 406.


STOHLMANN, PFARRE & CO.

Garrigues's weight speculum.

FIG. 407.



Schroeder's vaginal retractor.

cone-shaped and all the olive-shaped dilators, counter-pressure should be exerted on the fundus of the uterus by an assistant.

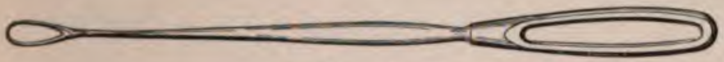
During the first three months of pregnancy, the cone-shaped and expanding dilators suffice, but from the fourth month the olive-shaped are required.

CHAPTER III.

CURETTAGE.

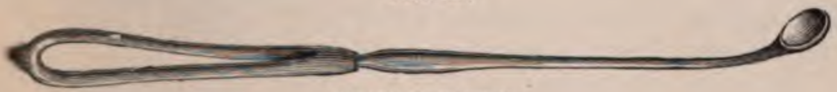
For emptying the uterus in abortion cases and sometimes after delivery, some scraping instrument may be needed. At a very early stage of pregnancy, say at the end of the first month, Sims's sharp curette (Fig. 408) or Simon's sharp spoon-shaped curette (Fig. 409) may be employed. During the second month Récamier's dull curette (Fig. 410) is quite useful. From the third month to the end of pregnancy Thomas's large dull wire curette (Fig. 411), with an inflexible shank and an eye large enough to admit the tip of the forefinger, is an admirable instrument, both for the purpose of loosening the ovum from the walls of the uterus and for removing it by seizing it between the instrument and the index-finger.

Fig. 408.



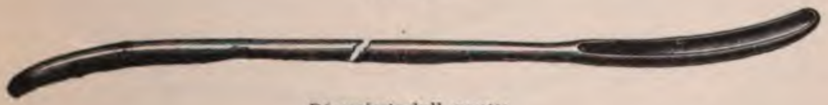
Sims's sharp curette.

Fig. 409.



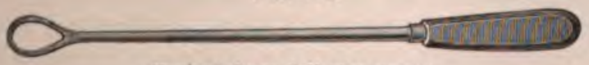
Simon's sharp curette.

Fig. 410.



Récamier's dull curette.

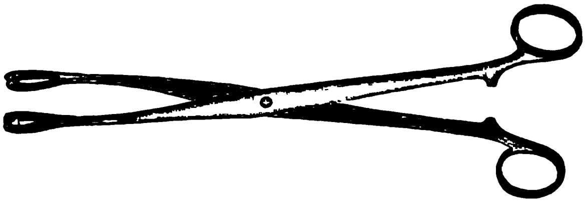
Fig. 411.



Thomas's large dull wire curette.

How much the cervix can be dilated depends, of course, chiefly on its size. A small uterus will only admit the curette. A somewhat larger one allows us to use the finger as a curette by seizing the uterus from above and pressing it down on the index-finger introduced through the vagina, but often the ovum is inserted so high up, right on the fundus, that we cannot detach it with the finger-nail, but must have recourse to a curette anyhow, and at all events the finger cannot remove the decidua vera. From the third month there is mostly room for the finger and the large dull wire curette, which work well together, the finger being pressed against the hole in the curette with part of the tissue to be removed caught between the two. For the removal of the fœtus a blunt forceps with heart-shaped or oval rings (Figs. 412, 413) may be required, and in rare cases the same instrument may be needed in removing the placenta, but in nearly all cases I prefer the combined use of the finger and the large curette.

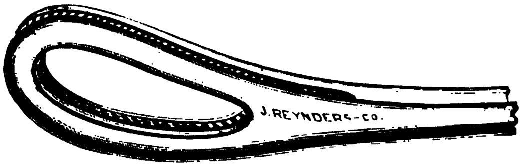
FIG. 412.



Placenta-forceps with heart-shaped jaws.

If for some reason no anæsthetic is used, one obtains better access to the interior of the uterus by placing the patient in Sims's position without pulling the uterus down. When the scraping is finished, the patient is turned back to the dorsal position, which is both more convenient and safer than the lateral during irrigation.

FIG. 413.

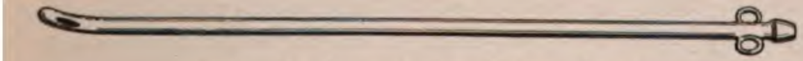


Placenta-forceps with oval jaws.

It is not possible to tell how much scraping should be done. The obstetrician must have in view that the pregnant uterus is much softer than the unimpregnated, and that the danger of perforating it is greater. Scraping should only be done by moving the curette from the fundus to the os, or laterally along the fundus or along the walls of the corpus, never from below upward. In a general way it may be stated that when moderate force is used, it is safe to scrape as long as anything comes off. What is to be removed is the fœtus, the ovum, and the decidua vera, as far as it comes off easily. It forms a spongy mass, easily recognized when once seen. In a case of abortion after double ovariotomy at two and a half months I curetted after the fœtus was expelled and the ovum which lay loose in the vagina had been removed, and scraped off four or five times as much tissue as that forming the ovum.[1] On Braune's beautiful plate representing a section of the frozen body of a woman at the end of the eighth week of pregnancy,[2] the decidua in the lower part of the uterine cavity is half an inch in thickness and the area of its cut surface is twice as large as that of the chorion.

Immediately before and after the curettage the uterine cavity should be flushed with two pints of a one per cent. emulsion of creolin, for which purpose I prefer a single-current metal tube (Fig. 414) fastened by means of a flange to the tubing of a fountain syringe. The bag is suspended about three feet over the table. It is sometimes practicable to fasten it to a gas-fixture or the knob on the blinds, or a nail driven into the window-frame, or have it held by an assistant; but since you cannot count on finding either, it is well to carry a screw-hook in your satchel, which is easily screwed into any woodwork.

FIG. 414.



Garrigues's single-current soft-metal intra-uterine tube.

The object of the preliminary irrigation is to remove blood, mucus, and some of the germs that may have found their way into the uterine cavity; that following the curettage serves to remove débris and arrest hemorrhage. If a rather free hemorrhage continues after the irrigation, I pack the uterus with iodoform gauze and then the vagina with cotton pledgets wrung out of creolin emulsion as described above. If there is little or no hemorrhage, I use only the vaginal plug and no intra-uterine packing. The vaginal packing is removed the next day, the intra-uterine is gradually withdrawn and cut short on the third and fourth day, and finally removed on the fifth or sixth. During these days the vagina is only filled quite loosely with iodoform gauze, which being in touch with the intra-uterine gauze serves as a drain. After all has been removed the vagina is irrigated twice a day with creolin or some other antiseptic, as long as there is any discharge. If no intra-uterine packing is used, this vaginal irrigation may be instituted the day the vaginal plug is removed.

---

[1] Garrigues, "A Case of Double Ovariotomy during Pregnancy," The Clinical Recorder, vol. i., No. 2, p. 49, April, 1896.

[2] Wilhelm Braune, Topographisch-anatomischer Atlas, Leipsic, 1875, Plate II.

When the uterus has been emptied and the tampon applied, I give a drachm (4 grammes) of the fluid extract of ergot, three times a day, until an ounce has been used in all. If the patient has any pain, there is no objection to the administration of an opiate; but, as a rule, all pain ceases after the removal of the vaginal plug. The reader may therefore ask why I put it in. In hospital practice it may be dispensed with if there is no bleeding, because in case hemorrhage came on later, the house surgeon could check it by tamponing; but in private practice it is safer to tampon the vagina for the first twenty-four hours after the curettage. The patient is kept in bed for a week, and in her room for another. If the abortion was caused by retroflexion, this should be treated during the after-treatment.

From the end of the fifth month the child may be born alive, inasmuch as its circulation may be maintained independently of the mother, and the muscles evidence contractility; but at this early period it is not viable. If the placenta is expelled spontaneously, or expressed by Credé's method, which is often possible at this stage, the case should be regarded as one of premature labor, and the treatment recommended for abortion is not indicated.

If pregnancy is terminated after the end of the fifth month, and the placenta is not expelled either by uterine contraction or expression, it is better to tampon the uterus and vagina and await further developments. If the placenta does not come away within twenty-four hours, the dressing should be removed and a new one left in place a day longer; but if the placenta does not come off in two days, its mechanical removal is urgent.

CHAPTER IV.

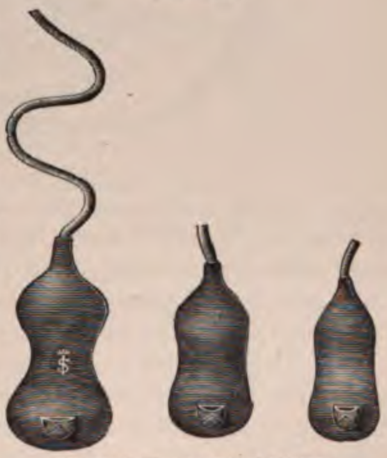
INDUCTION OF PREMATURE LABOR.

Labor may be induced in many ways, but some of them have proved vastly superior to others in regard to efficiency, safety, and expeditiousness. While the obstetrician always can perform artificial abortion, it is not so with the induction of premature labor. Here the collaboration of nature is an absolute requisite and must be solicited. We can do much to help nature, but the one thing we must await from her side is the contraction of the muscular wall of the uterus—without uterine contraction, no labor. In cases in which there is no particular hurry, it is well first to use repeated vaginal douches with hot water, or alternately with hot and cold water. As much as two or three gallons of sterilized water should be injected. If necessary, this may be followed by the application of a vaginal tampon. Under these circumstances it should be removed, and, if necessary, renewed every six hours.

Both these methods, however, have the drawback that they impair the epithelium of the vagina, and may be dispensed with if a bougie can be introduced into the cavity of the uterus. For this purpose we choose an English bougie No. 10, the French being too flexible. First, the bougie is disinfected by immersion for ten minutes in a solution of bichloride of mercury (1 : 1000) and lubricated with boiled glycerin with or without the addition of corrosive sublimate (1 : 1000). The varnish of the bougies is destroyed by carbolic acid, creolin, or lysol, which substances therefore should be avoided. We should use bougies, not catheters, in order to avoid admission of air to the uterine cavity, and they ought to be introduced without stylet, as this makes them too stiff and prevents them from sliding aside when they meet an obstacle. The lower numbers of bougies are too flexible, while No. 10 has given perfect satisfaction in the writer's hand.

The patient's vagina should be disinfected as described (p. 565), and then she should be turned over into Sims's position, which facilitates the introduction of the bougie very much. The os is exposed with Sims's speculum, and the cervix seized with a bullet-forceps. The placenta being commonly inserted on the anterior or the posterior wall of the uterus, it is better to introduce the bougie at one of the sides. If it meets with any resistance, it is twirled a little between the fingers, when often it slides in without further difficulty; but if it cannot be pushed in deep enough, another place should be tried. It should be pushed in to its full length, with the exception of the last two or three inches, which are bent in a circle at the vault of the vagina and held in position with a pledget of iodoform gauze.

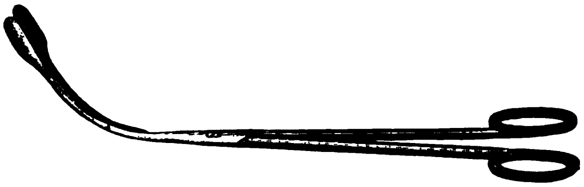
FIG. 415.



Robert Barnes's cervical dilators.

When the cervical canal is sufficiently dilated to admit a finger, the bougie may be removed and Robert Barnes's dilators used instead. These consist of a set of three fiddle-shaped rubber bags, with a tube of the same material (Fig. 415), at the end of which is a small metal tube with a screw-thread fitting another metal tube, which has a stopcock, by means of which fluid may be retained in the bag. At the other end this tube fits by mere apposition a third metal tube, which at its other end has a screw fitting a Davidson syringe No. 1. This may appear complicated to the reader, but in practice it is very simple, and this metal attachment, consisting of three pieces, is a great improvement. On the side of the bag is often found a little pouch, which is meant to give admission to the tip of a uterine sound, with which the bag should be introduced into the uterus. But this method is greatly inferior to the use of a curved forceps (Fig. 416). The sound is apt to tear the pouch, which by its projection increases the friction against the walls of the cervical canal, and serves as a receptacle for dirt hard to dislodge. When undilated the bags measure from 1¼ to 2¼ inches (from 3 to 6 centimetres) at the narrowest part; but, on account of their elasticity, when fully dilated, they measure 4, 5, and 7 inches (from 10 to 18 centimetres) in circumference respectively. They may be boiled with soda solution (p. 186) and be made slippery with lysol or creolin emulsion.

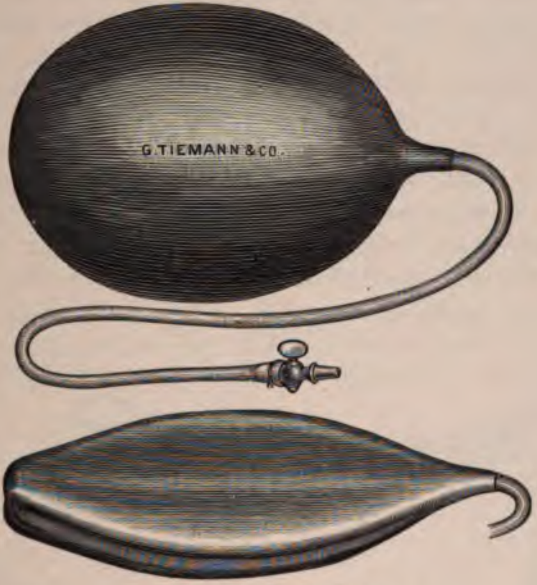
FIG. 416.



Forceps for carrying rubber bags or gauze into the uterus.

In order to introduce them they should be folded lengthwise and seized with the forceps. The patient should be placed in Sims's position, and the operator should place his left forefinger on the os and slide the forceps with the bag along the volar surface of the finger. The bag should be introduced so deep that its distal end rests above the internal os, the proximal end in the vagina, and the thinner middle part in the cervical canal. When it is in place, it is slowly filled with lysol solution (1 : 100) or sterilized water. When it is fully dilated it may be withdrawn without emptying it, and the next size introduced in its place. The action of these cervical bags may be intensified by placing a larger, more cylindrical bag in the vagina,—a so-called *colpeurynter* (Fig 417). The object of the dilators is indeed not only to obtain space for the passage of the child, but to call forth uterine contraction by reflex action. Sometimes we do not succeed in this, even after full dilatation with Barnes's dilators. Then the larger and unyielding coniform bag of Champetier de Ribes (Fig. 418), made of stout silk, covered with rubber, and ing a diameter of 4 inches (10 centimetres) at the base, may be stituted. It is used in the same way as Barnes's dilators, but ced just above the internal os in the lower uterine segment. It is roduced with a forceps made for the purpose (Fig. 419), but this

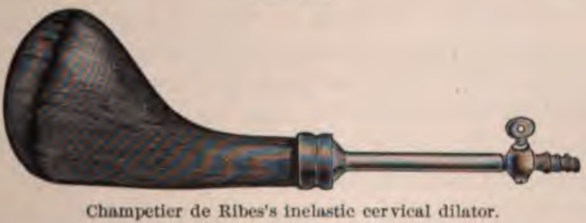
FIG. 417.



Peterson's colpeurynter.

y also be accomplished with the smaller instrument used for carry- Barnes's dilators or gauze into the uterus (Fig. 416). It may be until it is pushed out by uterine contraction, or this action may combined with a pull on the tube, either by attaching it to the end

FIG. 418.



Champetier de Ribes's inelastic cervical dilator.

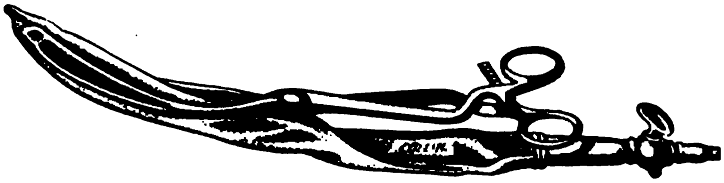
he bed, or making a connection with a weight of from one to four unds going over a pulley, or simply by pulling on the tube with hand.

If the other two methods—the bougie and the dilators—have not brought on labor-pains, or at least not sufficiently strong ones, the bag of waters may be ruptured, which may be done with a wire stylet or a goose-quill sliding on a sound. Many use this method from the start, and if there is an over-distention of the uterus, which prevents contractions, this is the way to be preferred, at least as the first step, which then may be combined with other methods, according to circumstances. This method should, however, as a rule, only be used if the vertex presents.

I shall mention another method invented some years ago and which also has been praised in this country,—namely, the injection of a tablespoonful of sterile glycerin above the os internum. This procedure was based on the great attraction for water possessed by glycerin, but, cases in which its use gave rise to hæmoglobinuria and chills having been reported, it should not be used.

Finally, the application of the constant electric current has been recommended. The positive pole is placed on the fundus, the negative in the cervical canal or on the vault of the vagina. At first weak currents should be used, and with intervals like normal labor-pains. Electricity is undoubtedly a powerful means of producing muscular contraction, but it would seem to be a little dangerous for the fœtus as compared with the three methods recommended above.

FIG. 419.



Bag in grip of forceps.

As to tents we refer to what we have said above (p. 566). Hanks's dilators may be used, but on account of their stiffness they are apt to rupture the membranes. If this happens, and the fœtus lies in cross presentation, we should try to save as much liquor amnii as possible and at the same time try to get the cervix dilated in order to be enabled to turn the child. On the other hand, if there is a favorable presentation with tendency to a change for the worse, it is well to rupture the membranes early.

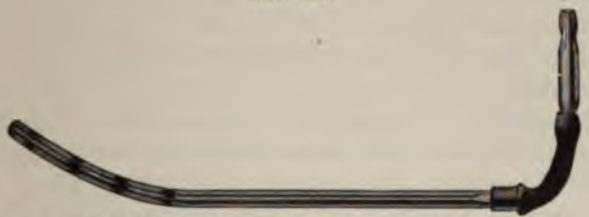
In whatever way labor is induced, the patient has to be watched almost constantly. In some cases the uterine contractions are soon elicited and labor progresses rapidly ; in others it takes days.

CHAPTER V.

VAGINAL AND INTRA-UTERINE INJECTIONS.

In hospitals a pail of glass or metal, especially agateware or other enamelled metal, is used as a reservoir in vaginal and intra-uterine injections. In private practice a rubber bag, a so-called fountain syringe, may be employed. It stands boiling in soda solution (about two per cent., or a tablespoonful to each quart of water) very well. The tube used for irrigation should in hospitals be of glass. For the vagina a straight tube about six inches long is used. In private practice, where only antisepsis is attempted, the nozzle of metal or hard ubber which comes with the fountain syringe may be used. For ntra-uterine injections Garrigues's glass tube should be used (Fig. 20). It is made of thick glass, is twelve inches long, one inch in cirumference, and slightly curved like a male catheter near the distal nd. At the end and on the last four inches are distributed nine openings. In order to adapt it easily to the rubber tube of the fountain syringe without risk of breaking the glass tube, it is convenient o have a short piece of rubber tubing permanently attached to it, and at the other end one of those short glass tubes with a neck near each end which are made for making connections and are found in he instrument stores (Fig. 420).

FIG. 420.



Garrigues's intra-uterine glass tube with attachment.

In order to protect the long glass tube against breakage, I carry it n a case, which is made of two thin wooden arm-splints a foot long ined with canton flannel and held together with a bag of muslin fiting them tightly. In this same case finds also room a wire with a hook near its end used for cleaning the tube by means of a bit of absorbent cotton. The tube may be boiled immediately before using it.

During an injection the patient should occupy the dorsal position with bent knees. She may be placed on a metal douche-pan (Fig. 217, p. 181) or she may be pulled so far over the edge of her bed hat one leg rests on a chair. A rubber sheet or oil-cloth is placed under her nates, and made to form a gutter descending from the genitals into a slop-pail. The patient may be placed also across the bed with the buttocks passing the edge, or she may be at the end of a table. In either case she lies on a rubber sheet or oil-cloth, which is pinned with two pins so as to form a funnel leading the recurrent fluid into a vessel placed on the floor. Whatever the patient lies on —pan, table, or bedstead—should be properly padded, so as to avoid the pain of pressure against a hard surface.

The *fluids* to be used are plain sterilized water, normal salt solution, or a one per cent. solution of creolin or lysol. Rarely less than two or three pints are used, and sometimes much more. In private practice there is, as a rule, no difficulty about obtaining hot water, but there is no sterilized cold water on hand. In order to have it for operative purposes, it is well, at the beginning of labor, to boil several quarts and let it cool off covered.

The temperature of the fluid varies from being lukewarm to being decidedly hot (110–115–120° F.), which latter has considerable hæmostatic power.

Before giving any kind of injection, the physician or nurse disinfects his or her hands and spreads the disinfected vulva open. For a vaginal injection the tube is inserted up to the vaginal roof and carried all around the cervix, so as to have every part of the vagina well bathed with fluid.

In the beginning of the antiseptic era I used a 1 : 2000 solution of bichloride of mercury for vaginal and intra-uterine injections, and later a 1 : 4000; but I soon convinced myself of their danger and substituted creolin, 1 : 100, for vaginal and intra-uterine douches. As stated above (p. 550), I collected from literature twenty fatal cases of mercurial poisoning in obstetric practice alone and added two from my own practice. Since then I have exclusively used for injection creolin or lysol.

The symptoms that have been observed in cases of *poisoning with corrosive sublimate* used in vaginal and intra-uterine injections are:

The *alimentary canal.* Thirst, foul breath, metallic taste, red or bluish color and swelling of the gums; redness, ulceration, and sloughing of different parts of the mucous membrane of the buccal cavity; deep ulcers in the tonsils; soreness and looseness of the teeth, and sometimes salivation; vomiting, abdominal pain, tenesmus; profuse, offensive, often bloody diarrhœa. The fæces contain mercury. It has been found in numerous cases after vaginal or intra-uterine injection of a solution of 1 : 3000, followed by the injection of plain water, and even after 1 : 4000. In the majority of cases it is found in the fæces already the next day, and it is still found a long time after discontinuing the use of the bichloride.

The *uropoietic system.* There is a marked diminution in the amount
ie urine, rising to absolute suppression of the secretion. The
is dark, grumous, contains much albumin, mercury, epithelial
from the kidneys, and hyaline and granular casts.

The *skin* is often covered with perspiration; it has been found
ræsthetic, itching, pale, or erythematous. Sometimes there is
iderable swelling of the subcutaneous tissue.

ie *nervous system.* In the beginning the patient is restless, and
rs from insomnia; later she becomes drowsy, sometimes de-
ıs, and finally she collapses. In some cases spasmodic twitch-
r cataleptic stiffness has been observed in the extremities. The
s are sometimes contracted as in opium poisoning. Occasionally
is a choking sensation.

'he *pulse* is rapid and weak, the *temperature* subnormal.

)f these symptoms the most characteristic are the diarrhœa, the
ıution or suppression of the urinary secretion, the stomatitis, the
emperature, and the presence of mercury in the stools and the
, as proved by chemical analysis.

'he chief changes found after death are hemorrhagic infiltration
extensive ulceration, sometimes diphtheritic patches and sloughs
ie large intestine. In some cases a lower degree of inflamma-
is found in the ileum. Exceptionally the œsophagus was inflamed,
in some cases there was local peritonitis. The mouth and throat
he seat of the above-mentioned changes.

nother constant affection is parenchymatous nephritis. Some-
deposits of phosphate or carbonate of calcium are found in the
oluted or straight tubules; but these calcareous deposits are often
nt, and may, on the other hand, be found under different circum-
es. In some cases the substance of the brain was dry; in others
were extravasations of blood in the meninges.

'arbolic acid* endangers life and health much the same as corro-
sublimate, and it is not so effective as an antiseptic. *Carbolism*
aracterized by the sudden loss of consciousness, convulsions, and
ı in coma. A solution of two per cent. has experimentally been
ed to possess rather weak antiseptic properties, which is corrobo-
l by abundant clinical experience; and, on the other hand, the
nt cannot stand a stronger solution. The daily use of this drug
so very irritating for doctors and nurses. The skin cracks and
ts, the fingers become numb, there is a very disagreeable sensa-
of cold in the hands, and the whole nervous system is affected
t. Its odor, especially when mixed with lochial discharge, is
easant and tenacious.

'reolin* is an excellent antiseptic, and so little poisonous that it
be taken internally in the dose of half a drachm (2 grammes)

or more three times a day without any bad effect. Up to three per cent. the emulsion is very pleasant to the skin. It makes all surfaces with which it comes in contact soft and slippery, and it has very considerable hæmostatic power. It can be used for all purposes in obstetric practice, except if, in cases of endometritis, we want to judge of the condition of the uterus by means of the character of the fluid returning from its interior. Under such circumstances a clear fluid is needed, such as plain water, normal salt solution, solution of carbolic acid (from one to two per cent.), or boric acid (the saturated solution,—that is, four per cent.). Otherwise it is of little importance that creolin forms an opaque mixture with water, since nearly all obstetric instruments are of large size.

Lysol is a brown fluid which forms a slightly greenish, soapy mixture with water, but mixed with blood it becomes almost black. It is serviceable in obstetric practice, in a strength of one-half to one per cent.

It is very desirable to have one of these two drugs, lysol or creolin, on hand in private practice, as they are slippery enough to allow the hand and arm to be introduced into the uterus without having recourse to the doubtful lubricants sold as aseptic and antiseptic.

In pelvic abscess the writer uses *tincture of iodine*, from one to three per cent.

Alcohol, fifty per cent., is also much used and praised for intra-uterine injection, but is rather expensive, since from one to two quarts are used for one injection.

When an intra-uterine injection is to be made immediately after delivery, the accoucheur should measure the distance from the vulva to the fundus by holding the tube outside of the body. Next he should introduce his left index and middle finger into the cervical canal and carry the tube in between these two fingers with the right hand, performing a circular movement corresponding to the physiological anteflexion of the uterus. If he meets with any resistance, he must beware of using any force, by which the uterine wall is easily perforated. He must change the direction of the tube until it enters easily, and he should not inject any fluid until by external palpation he has felt the end of the tube resting against the fundus of the uterus.

For intra-uterine injections the can should not be held higher than a foot over the uterus, so as to avoid the too forcible rush of fluid against the openings of the veins of the placental site. At the end of the injection the fluid should be squeezed out from the uterus. Before making any injection, vaginal or uterine, the air should be expelled from the apparatus by holding the tube upward and turning on the fluid.

Prophylactic intra-uterine injections are, in the author's opinion, indicated in every case in which it has become necessary to introduce fingers, the whole hand, or instruments into the uterine cavity. Since it is impossible to disinfect the vagina and the hand perfectly, some protection is afforded by washing out with an antiseptic fluid that part of the parturient canal that has been invaded.

The second indication for prophylactic intra-uterine injections is the birth of a macerated child surrounded by decomposed liquor amnii.

We have seen above (p. 203) that I use a prophylactic vaginal injection only if there is a purulent discharge during pregnancy.

As a curative measure vaginal and intra-uterine injections are used to arrest hemorrhage (pp. 512, 513).

CHAPTER VI.

INTRAVENOUS AND SUBCUTANEOUS INJECTIONS.

WHEN a patient has lost much blood, the quantity of fluid circulating through her heart should be increased. To do this with real blood is not convenient. Blood of animals must under no circumstances be used, as that causes a dissolution of the human blood-corpuscles. Human blood is not easily obtained, and must be defibrinated by beating it with a silver fork while it runs out of the donor's vein and strained through a clean cloth of tight texture, preferably white satin. While the blood is passing it *must not be stirred*, as otherwise fine emboli may be pressed through the straining-cloth and cause dangerous collapse.

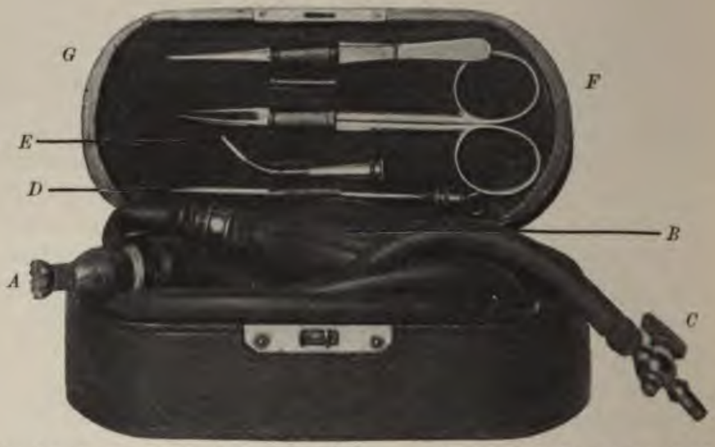
It was therefore a great improvement when it was discovered that blood-corpuscles are not needed in the injected fluid, and that the serum might be replaced by a solution of sodium chloride, so-called *normal salt solution* (6 : 1000, or practically an even teaspoonful to a quart of sterilized water).

If a prompt action is needed, a vein should be laid open at the patient's elbow and a quart of normal salt solution at a temperature of 120° F. be slowly injected in the direction of the heart. This may be done with my transfusion and infusion apparatus. In less urgent cases the fluid may be injected anywhere under the skin where there is much loose connective tissue, especially between the clavicle and the breast (*hypodermoclysis*).

If sterilized water is not obtainable, the injection under the skin should be made anyhow, as the patient is in danger of her life, but then large abscesses, that may take two months to heal, will develop, and be followed by unsightly scars. In such a case less conspicuous places should be chosen for the insertion of the needle. While the water enters, the region should be massaged, so as to press the fluid into the veins and gain room for a new quantity to be injected. Stimulants for heart and lung should be injected with a hypodermic syringe under the skin, especially strychnine (gr. $\frac{1}{30}$—2 milligrammes—until gr. $\frac{1}{10}$—6 milligrammes—in all is given), tincture of digitalis (♏x—60 centigrammes—repeated until ʒss—2 grammes—is given), and nitroglycerin (from gr. $\frac{1}{100}$ to gr. $\frac{1}{25}$—from $\frac{1}{2}$ milligramme to 2 milligrammes). Injection of ʒss—2 grammes—of a solution of 1 part of camphor in 4 parts of sterilized olive oil into the deltoid or vastus externus is efficacious and harmless.

The writer has constructed an apparatus for transfusion and infusion[1] (Fig. 421), which is so small and light that it can easily be carried in the obstetric bag. It is essentially a diminutive Davidson's syringe. It consists of two rubber tubes, united by a rubber bulb with two metal cup-valves opening in the same direction. At one end of the instrument is a tin plunger, at the other a nickel-plated stopcock and silver canula or needle. The canula is of small calibre, tapering, probe-pointed, and flexible.

FIG. 421.



Garrigues's apparatus for transfusion and infusion. *A*, plunger; *B*, bulb; *C*, stopcock; *D*, needle; *E*, flexible probe-pointed canula; *F*, scissors; *G*, thumb-forceps.

The whole instrument can be boiled. Before using it all air should be carefully driven out by completed compression of the bulb while the plunger and the tip of the canula are immersed in the fluid, which is kept in a bottle surrounded by hot water in order to prevent the temperature of the fluid from sinking. This may vary from 110° to 120° F. From a pint to a quart may be injected.

---

[1] Garrigues, "Apparatus for Transfusion," Amer. Jour. Obst., vol. xi., No. 4, October, 1878.

A vein is exposed at the elbow-bend by folding the skin over it and incising it. If no vein is visible, it may be made so by compression above the wound as for phlebotomy. In order not to lose the vein, if by chance the canula should slip out of it, it is advisable to pass a probe or a double thread under it. The best way of opening the vein s to seize its anterior wall with a fine pair of forceps or a tenaculum nd make a nick in it with a pair of fine scissors. Thus a minute flap s formed, under which the point of the canula is introduced in the irection of the heart. The fluid should be injected very slowly, in rder to avoid dilatation of the right side of the heart. Three seconds hould be the very shortest time left between two compressions of he bulb. The bulb holds three drachms, but by moderate pressure nly two drachms are expelled from it. If a resistance is felt, the njection should be interrupted or discontinued altogether. The same ule applies when dyspnœa or other untoward symptoms occur. After he operation the wound is dressed as after phlebotomy.

The same apparatus may be used for hypodermoclysis, only that needle then is used instead of the canula. The needle may also be ttached to a fountain syringe, where gravity is used as motor power.

CHAPTER VII.

ARTIFICIAL DILATATION OF THE CERVIX DURING LABOR.

THE forceps should never be applied before the os is perfectly ilated, and the same rule applies to version, if it is to be followed mmediately by extraction. Since, on the other hand, the life of the nother and that of the child may depend upon a speedy delivery, the ccoucheur should be perfectly familiar with all means by which the ilatation of the cervix may be induced, increased, or completed.

The induction of premature labor has been discussed in Chapter V., p. 572.

During labor we have many means of dilating the cervix.[1] Certain *drugs* are of more or less value in this respect, and may be used hen there is no immediate danger, or may be combined with the echanical resources presently to be reviewed.

From olden times belladonna has been used. To smear the cerix with unguentum belladonnæ must be looked upon as obsolete, on ccount of the danger of infection, but in the refined shape of *atro-*

---

[1] Garrigues, "The Dilatation of the Cervix Uteri in Obstetric Practice," ed. News, September 21, 1901, p. 447.

pine, dissolved in sterilized water, it may be injected in the dose of $\frac{1}{40}$ grain ($1\frac{1}{2}$ milligrammes) into the tissue of the cervix. The cervical portion may be painted inside and outside with a 10 per cent. solution of *cocaine*. *Chloral hydrate* given by the mouth in the dose of gr. xv (1 gramme), repeated every twenty minutes, for three or four doses, has an excellent effect. *Antipyrin*, gr. x (60 centigrammes) every half hour, if necessary three times, has undoubtedly great oxytocic value, and so has *strychnine*, gr. $\frac{1}{30}$ (2 milligrammes), repeated every twenty minutes, until gr. $\frac{1}{10}$ (6 milligrammes) has been given. *Quinine* in ten-grain doses has also been praised for its action in strengthening labor-pains and thereby contributing to the dilatation of the cervix. *Ipecacuanha*, gr. ii to v (12–30 centigrammes), repeated every twenty to thirty minutes, is disagreeable in so far as it nauseates the patient, but it conquers rigidity of the cervix.

Dr. A. Rose, of New York,[1] praises a vaginal douche of carbonic acid. The gas may be generated by mixing a solution of ʒvi (24 grammes) of bicarbonate of sodium with ʒiv (16 grammes) of tartaric acid, in large crystals, which produce a slow development of carbonic acid. The solution is kept in a wide-mouthed glass bottle, with perforated rubber stopper, through which goes a hard-rubber tube. To this is attached a soft-rubber tube, ending in a vaginal nozzle of hard rubber. The gas is said to anæsthetize the vagina and cervix and to cause dilatation of the latter, but is chiefly efficacious in primiparæ, much less in pluriparæ.

Among the mechanical means available, when there is no hurry, I shall first mention the introduction into the uterus of a *bougie*, which, in the author's experience in confinements at term, has proved a powerful inciter of the uterine contractions in cases of absent labor-pains.

Tamponade may be applied to the vagina, the cervix, or the interior of the body of the uterus. A good way of obtaining dilatation of the cervix is to insert a strip of iodoform gauze into the cervical canal as far as it will go and pack the vagina with the same material or absorbent cotton wrung out of creolin (one per cent.). The next day the packing is removed, when the internal os will probably be found so dilated that new gauze may be placed beyond it, inside of the lower uterine segment, where it works as an irritant, calling forth uterine contractions.

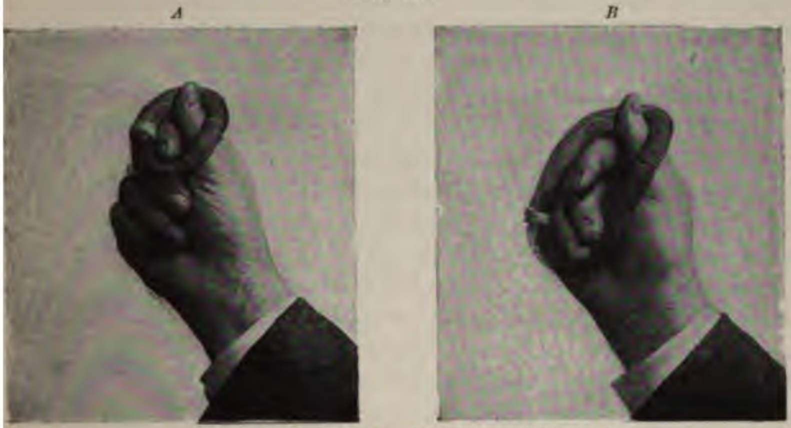
If the situation is such that we want the os dilated as rapidly as possible, for instance, in a case of uterine hemorrhage, we have different resources, namely, manual dilatation, dilatable bags filled with a fluid, expanding metal dilators, and deep cervical incisions.

Manual Dilatation.—Those who have not tried it have no idea how en the cervix towards the end of pregnancy is so dilatable that in m fifteen to twenty minutes it may be fully dilated. Manual dila-ion, as introduced by Dr. Philander Harris, of Paterson, N. J., fers much from what was known a few years ago and is still taught Europe. According to the old method we introduce first one finger, en two, three, four, the whole hand formed into a cone, always

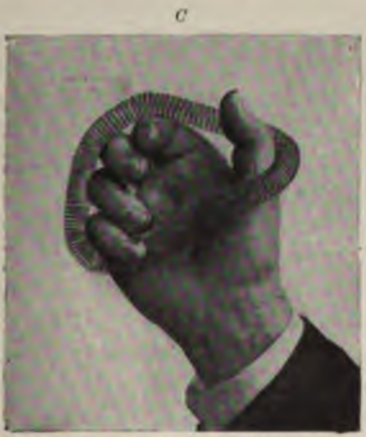
---

[1] Rose, Deutsche Praxis, No. 11, 1901.

FIG. 422.



Harris's method of manual dilatation of the cervix.



Harris's method of rapid dilatation of the cervix, last stage.

essing upward, using the extensor muscles of the hand and arm, th counter-pressure on the fundus. In Harris's method[1] the thumb d fingers are crossed, and the cervix is opened by lateral pressure ercised by the flexor muscles of the hand and forearm.

This method is applicable in any case of delivery towards the end of pregnancy, say from the end of the seventh month, provided the index-finger can be inserted through the cervical canal to its full extent. First the index-finger is introduced by simple pressure against the os. Next the finger is drawn back to its tip, and the tip of the thumb made to enter together with the former. As soon as the thumb and first finger have passed the os, they are crossed (Fig. 422, *A*), and pressure is exerted on the os. Gradually the second, third, and fourth fingers are added and bent like the index-finger (Fig. 422, *B*). Finally, the thumb is stretched and the os made to surround its first phalanx and the second phalanx of the somewhat separated, bent fingers (Fig. 422, *C*). During all of these manipulations the hand reposes in the vagina. In from sixteen to twenty-two minutes full dilatation is obtained, allowing podalic version and extraction.

---

[1] P. A. Harris, Amer. Jour. Obst., 1894, vol. xxix., No. 1.

Another method of manual dilatation that is used a great deal in this country is that invented by the French obstetrician Bonnaire for the treatment of placenta prævia. While Harris uses only one hand, Bonnaire employs both. The patient is anæsthetized and placed on a table in the dorsal position, with her legs strongly flexed. If she is not in labor the right index-finger is bored through the cervix as in Harris's method. When it has passed the internal os, it is used to massage the surrounding tissue in an excentric direction. When the canal is sufficiently dilated the left index is inserted parallel to the other and back against back. If the cervix is short, or, still better, if it is partially dilated, it is easy to introduce the two fingers, but if it is long and situated high up in the pelvis, it is necessary to let an assistant press the uterus down through the abdominal wall. The operator introduces his two index-fingers as deep as he can and separates the cervical walls transversely, and, at the same time, pulls them downward. Sliding the fingers up alternately he succeeds finally in passing the internal os. Next, those two fingers are bent outward, using the metacarpophalangeal joint as a fulcrum. By moving them to different points of the circumference and massaging the cervix, this is gradually softened and made to yield. No sudden or great force should be used; the flexors of the hands only should be contracted; the object is rather to tire out the cervical sphincter than to overcome it by main force. If the accoucheur hears a crackling sound it means that some fibres of the cervical muscle have been ruptured, when it is advisable to moderate the pressure and change the direction. When the cervix is wide enough, the right middle finger is inserted with the two index-fingers, next the left middle finger, then the third finger of the right hand, and finally that of the left. By means of these six fingers the cervix may be fully dilated till the edges simultaneously touch the two sides of the pelvis.

Either of these methods of manual dilatation is preferable to the pressure with the cone-shaped hand, which is apt to cause great tears in the parametria and the broad ligaments, and does not furnish the same degree of dilatation. They are also preferable to any hard dilating instrument. Having the fingers directly in contact with the tissues we press on, we can better judge of their condition and handle them with greater gentleness.

Bags capable of being filled with fluid are also of the greatest value. We have two classes of apparatus of this kind,—the elastic and the unyielding. The elastic bag was first used in the vagina as Braun's *colpeurynter*, an egg-shaped rubber bag with a tube and stopcock. It may be filled with ice-water and thus add the element of refrigeration to that of pressure. As a tampon it is inferior to other devices, but as an exciter of labor-pains by reflex action it has considerable power.

Tarnier invented a little bag with tube which placed above the internal os irritated the lower uterine segment by direct contact.

Barnes's dilators (Fig. 415, p. 573) add to this irritation direct expansion of the cervix. They are most excellent as far as they go. I cannot even subscribe to the common complaint that has been uttered against them that, on account of their elasticity, they become more dilated at the two ends and less in the middle, where dilatation is most needed. I have used them for many years and would not think of going to a confinement without them, and I have certainly found that they dilate until the fiddle-shape is changed into a cylinder, when they are pushed out. But even the largest dilatation obtained is only 7 inches (18 centimetres) in circumference, or about 2¼ inches (6 centimetres) in diameter.

It was therefore a decided improvement when Champetier de Ribes invented his pear-shaped, unyielding bag (Fig. 418, p. 575), which when fully dilated measures nearly 4 inches (10 centimetres) across the base. A rope may be attached to the tube of the bag and led over a pulley. To the other end of the rope may be fastened weights.

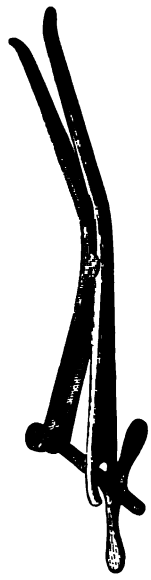
In spite of indisputable merits, this dilator is not without drawbacks. It is apt to provoke too rapid and violent contractions, it favors the prolapse of the umbilical cord, and it may push the presenting part away from the brim of the pelvis.

This dilator is particularly praised for the induction of premature labor, and in placenta prævia, the treatment of which formidable complication it has changed. Instead of turning by Braxton Hicks's method (see below) and using the breech and thigh of the fœtus as a tampon, the large unyielding bag, introduced through the torn membranes or perforated placenta, arrests hemorrhage by direct pressure of the bleeding surface of the uterus and allows the use of the forceps, which has diminished the fetal mortality enormously.

Hard Dilators.—The hard dilators may also be divided into two classes,—those by which pressure is exercised all over the circumference, but chiefly in the direction of the longitudinal axis of the cervical canal, and those which only exert lateral pressure, but then necessarily only on comparatively small surfaces at a time. The first class of instruments are cone-shaped or olive-shaped. There are a set of coniform dilators devised by Hanks (Fig. 402, p. 566) and Garrigues's set of small and Hanks's of large olive-shaped dilators (Fig. 404, p. 567). These instruments are all useful in abortion cases and the induction of premature labor. In delivery at or near term the expanding dilators are preferable. Arthur Müller's (Fig. 423) has two branches. Bossi's has three. In severe labor cases the cervix can be opened with these expanding dilators in from fifteen to twenty minutes, and in abortion cases sufficient dilatation is obtained in five or six minutes.

To instruments applies the same that we said above about manual dilatation. Lateral pressure, even if exercised only on a few points of the circumference at a time, is to be preferred to the pushing upward of large bodies in the direction of the cervical canal. By moving the rods of the expanding dilators around to different points of the cervix, we obtain an even dilatation and are less apt to tear the cervix and the parametrium.

FIG. 423.



Cervical dilator of Arthur Müller, of Munich.

A *weak electric battery current*, the positive pole at the fundus, the negative on the sides of the cervix, in the cervical canal or against the vault of the vagina, may be used, but demands caution, in order not to harm the fœtus.

Finally, we have the *deep cervical incisions*. To make several small incisions in the circumference of the os is an old method that often has proved useful in overcoming rigidity of the cervix, but sometimes these incisions tear out, and it cannot be calculated how far the laceration will extend. Of late years a regular operation has been substituted by Dührssen, of Berlin. He makes two lateral incisions, and adds sometimes a posterior and an anterior in the median line. These incisions divide the whole cervical portion out to the vaginal vault. In order to obtain the full length of these incisions, it is necessary to seize the cervix with two pairs of bullet-forceps and cut between them. The advantage of this method is that it affords space immediately, but it is indicated only when the cervix is obliterated and the os not sufficiently dilated. Before delivery these incisions do not bleed much, because the uterus is compressed between the head of the fœtus and the brim of the pelvis. But after the expulsion or extraction of the child, when the pressure ceases, there is apt to come hemorrhage. Even such deep incisions may tear farther and give rise to an irregular wound. The danger of infection is also increased. The incisions do not always heal together, in which case there would remain a laceration of the cervix. If these incisions are made at all, they ought therefore to be united with sutures immediately after delivery, by which hemorrhage is arrested and linear union without cicatricial tissue is obtained. But to put in stitches with the defective assistance and arrangements usually found in private practice is no easy matter. In order to make the wounds accessible, an assistant should press the uterus well down into the pelvis, when the edges of the wounds may be seized with forceps and stitched together. It must be admitted that by this method a child's life may be saved that otherwise would be lost; but it exposes the mother to immediate danger and remote suffering. It can therefore hardly be recommended when compared with bloodless dilatation, manual or instrumental.

Indications for Artificial Dilatation of the Cervix during Labor.—This operation is indicated when the labor-pains are defective in strength and frequency; in eclampsia; in ante-partum hemorrhage; in any other condition that jeopardizes the mother's life, and in which amelioration may be expected by the speedy termination of labor; and finally when the life of the fœtus is endangered, for instance by prolapse of the cord (p. 414).

CHAPTER VIII.

EXPRESSION OF THE FŒTUS.

PRESSURE may sometimes be used to great advantage for the purpose of delivering a woman. We have mentioned how the head may be enucleated by pressure through the rectovaginal septum (p. 193). We have recommended pressure from above on the after-coming head in breech presentations, either alone or combined with traction on the shoulders of the fœtus (p. 384), by which the chin is pressed against the fetal chest, and the head made to pass the pelvis with its small diameters.

Pressure through the abdominal wall may also be used when the head presents. If the head does not engage itself in the brim, the engagement may be favored by direct pressure on the head above the symphysis pubis. In cases of inertia uteri we have recommended (p. 358) to rub the fundus and to press on it.

Pressure should be resorted to only in the second stage. If exceptionally there are intestinal knuckles lying between the abdominal wall and the uterus, they should first be pushed aside. Next the accoucheur places his thumbs in front of the fundus and the eight fingers behind it and exercises pressure in the direction of the pelvic brim, beginning very gently and gradually increasing in strength, thus imitating natural labor-pains. The pressure should be intermittent and chiefly be used as an adjuvant to already existing contraction.

The method is of special value in those cases in which the contraction ring has receded high up. The fœtus is pushed into the cervix and vagina, and the uterus has no longer any power over it (p. 172). Now the abdominal pressure should take the place of the uterine contractions, but the woman may be exhausted or shun the pain produced by contraction of the abdominal muscles. Then the pressure by the accoucheur may replace it. But since this also causes pain, it may be well to give a little chloroform.

If after the birth of the head the shoulders do not follow easily, pressure on the fundus may be all that is required for a speedy delivery.

The method may be particularly indicated if there is no forceps at hand or if the patient objects much to any use of instruments.

CHAPTER IX.

PREPARATION FOR OPERATIONS.

The more common operations, such as forceps extraction, version, and perineorrhaphy, may be performed without removing the patient from her bed, but she should be placed *across the bed* with a pillow under her head and shoulders, the buttocks drawn well over the edge of the bed, and each leg bent at the knee and placed perpendicularly on a chair, while the operator stands, sits, or kneels between the two chairs. Each knee is to be held by an assistant, but they need not be skilled; nor is it necessary that they see what the operator is doing, which is so much more valuable since the unusual sight is apt to produce faintness and incapacity for further assistance.

For the greater operations—symphyseotomy, Cæsarean section, and embryotomy—the patient should be placed on a *table*, as for any major operation. A common kitchen table, four feet long and two feet wide, is very convenient. It should be covered with a folded blanket or quilt, a muslin sheet, and a rubber sheet or oil-cloth. The last-named should be pinned together so as to form a funnel leading from the lower end of the table into a pail. Instead of this arrangement an inflatable rubber cushion with apron may be used (Fig. 219, p. 182). A pillow is placed at the head of the table, and this end is slightly raised so that fluids gravitate into the pail.

In hospitals tables are used that can be thoroughly disinfected, and that have stirrups for raising the feet and arrangements for elevating the pelvis.

In private practice the elevated-pelvis position may be improvised by means of a chair or an ironing-board (Fig. 330, p. 416).

Position.—The best positions for the patient to occupy during the different stages of normal labor have been discussed on p. 191. For operations, as a rule, the *dorsal* position, with somewhat raised head and shoulders, bent knees, and spread heels, is the most convenient. Exceptionally, especially in performing version, the *lateral* position, on one or the other side, gives easier access to the uterine cavity. The *elevated-pelvis position* is used to advantage in the reposition of the prolapsed cord.

A *sitting* posture is used less nowadays than formerly, when a delivery-chair formed part of a well-appointed trousseau. The time of this piece of furniture, that sometimes descended from one generation to the other, and was one of the requisites of a midwife, is gone, and the position is rarely needed. But as a matter of fact it is probably the most common position instinctively taken by the unassisted woman in labor. To crouch down on her feet is, however, very fatiguing. The comfort of support may easily be supplied by placing two chairs together so that they touch each other with the backs and leaving the seats separated at an angle of about forty-five degrees. The patient may sit with one buttock on each chair, which leaves free access to the genitals. An assistant should support her from behind, and the accoucheur sits on a low chair or footstool in front of the patient ready to receive the child and prevent it from falling on the floor.

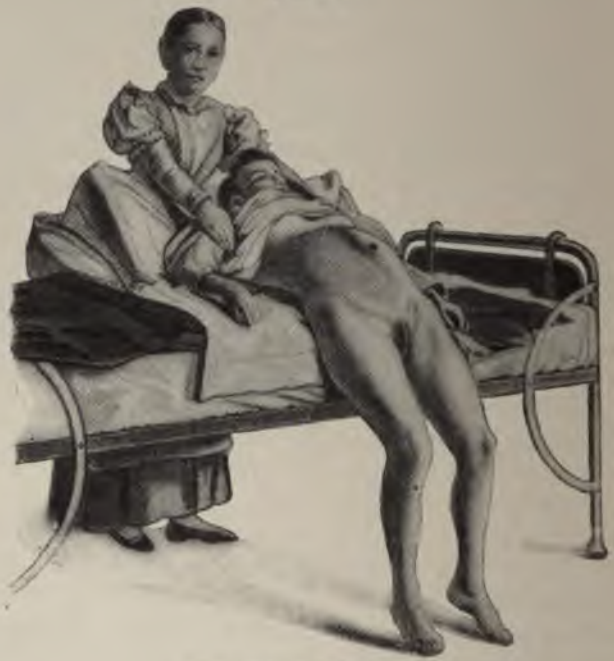
Hanging Posture.—It has been known for centuries that in difficult deliveries some aid might be obtained by laying the patient on a high couch and letting her legs hang down, just touching the floor. This position has been scientifically investigated of late years and is now known as the hanging posture of Walcher (Fig. 424). In this posture an increase in the true conjugate of from five to thirteen millimetres (¼–½ inch) is obtained. This is due to a rotation taking place in the iliosacral articulation, the innominate bone being moved forward and downward by the weight of the lower half of the body or by traction on the fœtus.

This position is, therefore, of value in minor degrees of mechanical disproportion between the brim of the pelvis and the presenting part.

It may be utilized in extraction, be it by hand or forceps, to pull the head into the pelvic cavity, and may to advantage be combined with pressure from above.

Anæsthesia.—For all operations the patient should, as a rule, be anæsthetized. It is not only humane to do so in order to avoid pain, but most operations are performed more easily when muscular contraction on the patient's part is eliminated. This applies particularly to examination with the whole hand, correction of faulty positions, and extraction. But the patient may be so weak from loss of blood or nervous exhaustion that it would add to the danger to anæsthetize her, and then it should not be done.

FIG. 424.



Hanging posture of Walcher.

For common operations, chloroform, which ought always to be present, is quite available. For longer operations, such as symphyseotomy, Cæsarean section, and embryotomy, I prefer ether as the safer anæsthetic.

What to do in cases of eclampsia with a urine loaded with albumin is hard to say, the advice of the experimenters diverging widely on this important point. Schleich[1] contends that on account of its high boiling-point—149° F.—chloroform can be eliminated only through

---

[1] Schleich, Schmerzlose Operationen, third ed., Berlin, 1898, p. 60.

e kidneys, and not through the lungs, as is ether. According to him,
loroform is, therefore, more dangerous than ether when the patient
ffers from nephritis. On the other hand, Drs. W. H. Thomson and
C. Kemp,[1] basing their views on experiments on dogs and rabbits
th the oncometer, an instrument which shows the circulation in
e kidney as compared with that in the general system, declare that
loroform has no effect on that organ, while, according to them,
her is contraindicated in kidney disease, especially albuminuria with
ndency to pulmonary œdema, which is the condition in eclampsia.
far I have always avoided ether in kidney complaint.

Chloroform depresses the heart, which ether strengthens, but in
egnancy and labor we have a strong heart-action which counter-
lances the depressing influence of the drug. Ether is more dan-
rous than chloroform when the lungs, the larynx, or the trachea is
fected, and in patients suffering from congestion of the brain. If
art trouble is combined with lung disease, ether is more contra-
dicated than chloroform. As stated above (p. 206), I do not think
e subarachnoid injection of cocaine, on account of the short dura-
on of the anæsthesia in some cases, apart from the unreliability and
e danger inherent in the method, recommends itself in such work.

If there is no skilled assistant present, the doctor must himself
æsthetize the patient and place her in the proper position, and
ereafter direct the husband or nurse to continue the anæsthesia
der his direction. For the greater operations proper skilled assist-
ce is imperative. If it cannot be obtained, the patient should be
noved to a hospital where it is found.

The bladder should always be emptied with a catheter immedi-
ly before operations, and the rectum with an enema, if it has
t recently been done.

Life of the Fœtus.—Before deciding on any obstetrical operation
accoucheur should ascertain by means of the stethoscope or pal-
ion whether the fœtus is dead or alive, since the choice of the
per operation in most cases varies materially with its life or death.
en the fœtus is dead, everything ought to be done to facilitate
ivery for the mother. While it is alive it is entitled to our full
sideration. Nothing is more common, when an obstetrical opera-
n is proposed, than for the husband to say, "Save my wife; I
not care for the child." The accoucheur's aim should, however,
to save both, if it is feasible. Only when the interest of the
ther and that of the fœtus become directly opposed to each other,
t of the mother must outweigh the other. The mother is an
eady existing human being, her husband's companion, perhaps
ther of other children, or dear to other human beings, while the

---

[1] Thomson and Kemp, Medical Record, Sept. 3, 1898.

fœtus is only a possibility, that may die before it is born, or be a cripple or an idiot, who will cause its parents more sorrow than joy, and whose life will be of little value to itself and the community. (Compare ARTIFICIAL ABORTION, p. 269.)

Asepsis and Antisepsis.—Since it is never known beforehand what complications may arise in a confinement case, and the result of the operations, inclusive of the patient's life, largely depends on the avoidance of infection, it is of paramount importance to use all the aseptic and antiseptic precautions recommended in speaking of the management of normal labor (pp. 185, 188, 190). The author has there expressed his views in regard to the question of disinfection and sterilization. In lying-in hospitals an obstetric operation should, of course, be performed with the same minute care in regard to avoiding sepsis as any other surgical operation. In private practice we must, as a rule, be satisfied with the disinfection of the hands and patient, as described. Instruments and rubber articles can easily be boiled, and by adding common washing-soda (a tablespoonful to each quart of water), which is found in most houses, perfect asepsis is obtained in two minutes. Cold sterilized water is very desirable, both for cooling the boiled instruments and for mixture with hot water in order to obtain a proper fluid for injection into the vagina, the uterus, or under the skin. It is therefore well, in the beginning of labor, to order some suitable vessels filled with water, boil it, and leave it covered until needed (p. 577).

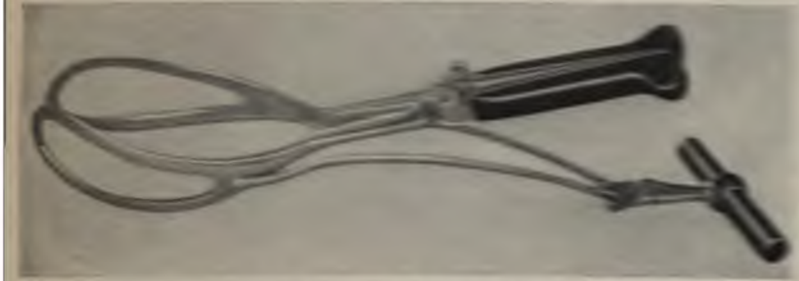
Consultation.—Before operating, it is necessary to notify the husband or other friends in a general way that some operation is needed to deliver the woman. Often it is wise to ask for a consultation with a specialist or another physician. Even if the accoucheur is capable of doing the work himself, he may need skilled assistance.

CHAPTER X.

FORCEPS DELIVERY.

The Construction of the Forceps.—Before entering on the question of forceps delivery, one must make it clear what is meant by an obstetric forceps. There are many kinds of forceps, long and short, straight and curved, symmetric and asymmetric; some destined to lie in the sides of the pelvis, others in the anteroposterior diameter, etc. The instruments differ so much in size and shape that one can be used for purposes for which another is inadequate or useless. There are hundreds of different forceps, and new models are being offered all the time. The literature on this subject fills volumes. In a text-book like this it would be out of place to enter into the details of the istory of this instrument and describe its numerous varieties. We

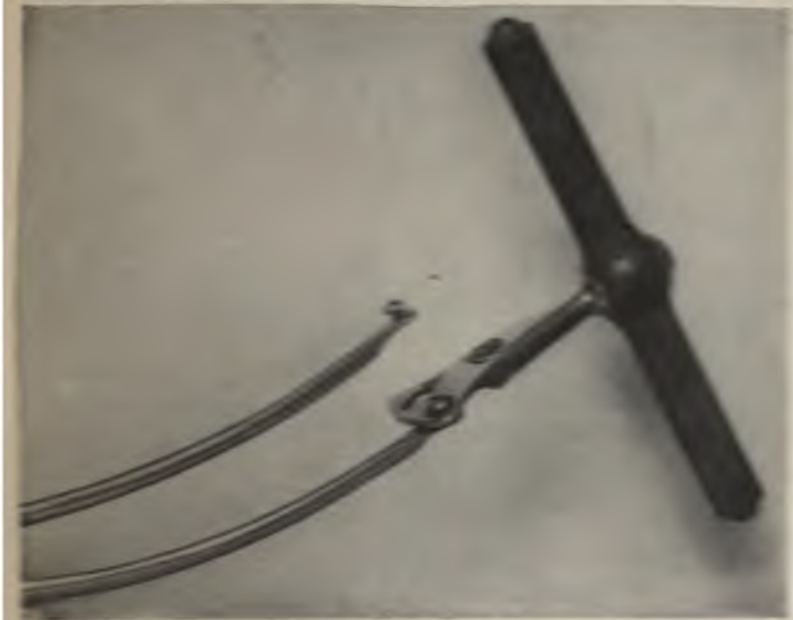
FIG. 425.



A. R. Simpson's axis-traction forceps.

dmit that it may be convenient in a lying-in hospital to have special inds of forceps for different cases, but the general practitioner will ardly buy more than one forceps, and it becomes somewhat a question f expediency which we shall recommend him to buy. I will state

FIG. 426.

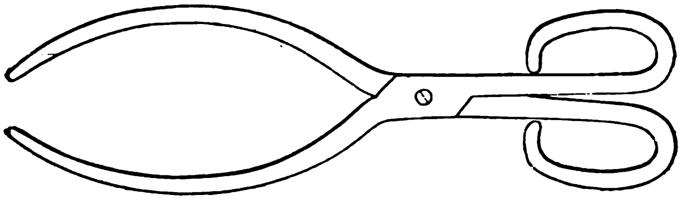


Handle of the same.

ight here that since 1880 I have exclusively used Professor Alexander ussell Simpson's axis-traction forceps (Figs. 425, 426), which can as well be used for the simplest and easiest deliveries as for the most difficult. Accident may have had some influence on my choice. In a case of contracted pelvis I tried both Simpson's and Tarnier's forceps. While I could not apply the latter, the former gave entire satisfaction. I therefore introduced it in my service at the New York Maternity Hospital, and placed it in my satchel instead of the one without traction rods which I had been accustomed to use.

The obstetrical forceps was invented by a member of the Chamberlen family, and almost certainly by Peter Chamberlen, senior, born in Paris, whose parents emigrated to England in 1569, where they changed their name from Chambellan to Chamberlen. Peter Chamberlen the elder, his brother Peter Chamberlen the younger, and the son of the latter, Dr. Peter Chamberlen, all used the instrument, but kept its construction secret for mercenary reasons. The original instruments belonging to Dr. Peter Chamberlen have been found and are kept in the Medical and Surgical Society of London. They have a cephalic curvature, crossed, separable branches, but no pelvic curvature (Fig. 427). This short straight forceps was further developed by Levret, of Paris (1747), who later added the pelvic curvature (Fig. 428) and made the instrument so long that it could be used at the superior strait, and by Smellie, in England (1751), who had a short, straight, and a long, curved forceps, and invented the lock used ever since on English forceps. Since then numerous prominent professors of obstetrics and many obscure physicians have remodelled the forceps.

FIG. 427.



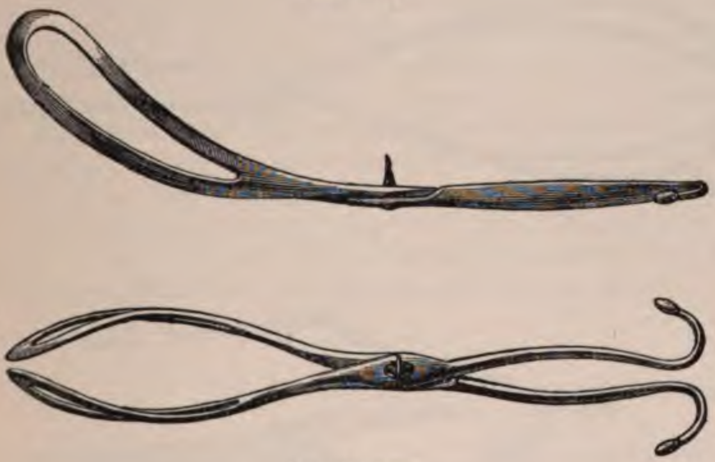
Chamberlen's forceps.

The forceps is an instrument chiefly destined for delivering the head and occasionally also applied to the breech.

Most modern forceps are made of metal alone, and if hard rubber is used on the handles, on account of its low specific weight, it is vulcanized on the metal in such a way as to avoid crevices in which dirt may lodge. For the same reason all ornamental furrows are discarded.

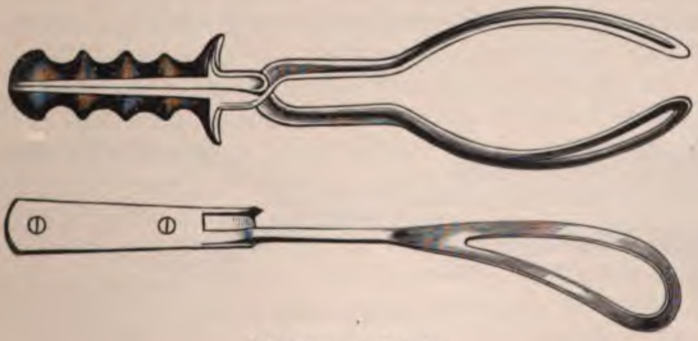
The forceps consists of two *branches*, or *arms*, crossing each other at the *lock*. Each branch is composed of three parts, the *handle*, the *shank*, and the *blade*. The handles are more or less voluminous and have on most forceps wings at the proximal or distal end and along their sides indentations for the fingers. At the upper end of the handle is the so-called lock. In the French forceps this is a real lock closed with a screw fitting into a slot on the upper blade and a hole in the lower. In the English forceps the lock is reduced to slanting surfaces corresponding to each other and a projecting wing (Fig. 429). The German lock is a combination of the two, having the same slanting surfaces as the English and a button on the lower branch corresponding to a slot in the upper (Figs. 430, 431).

Fig. 428.



Levret's forceps.

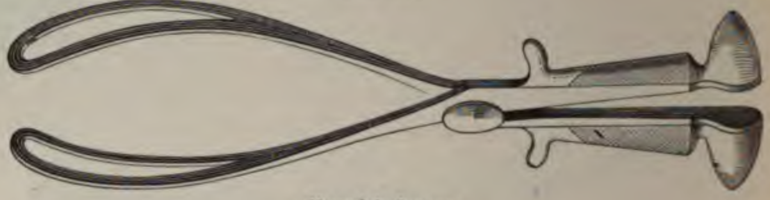
Fig. 429.



J. Y. Simpson's forceps.

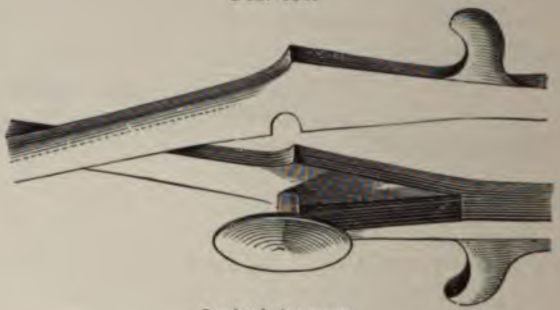
The shank is a stout, angular or cylindrical part forming the connection between the handle and the blade. The blade is a spoon-shaped, flat part, which on most forceps has a large pear-shaped opening, called the *fenestra.* As the blades are made to grasp the fetal head, and come in direct contact with the uterus, vagina, and vulva of the mother, all sharp edges should be avoided. The instrument should be long enough to seize the head at the superior strait, and strong enough to stand the resistance of a fetal head and a contracted pelvis, but at the same time not unnecessarily large and heavy, as this makes its application more difficult, tempts the accoucheur to use undue force, and increases the weight of his satchel.

FIG. 430.



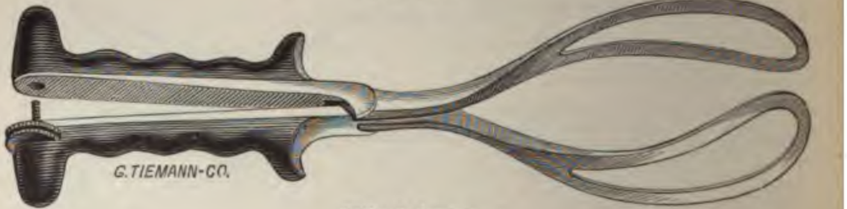
Naegele's forceps.

FIG. 431.



Lock of the same.

FIG. 432.



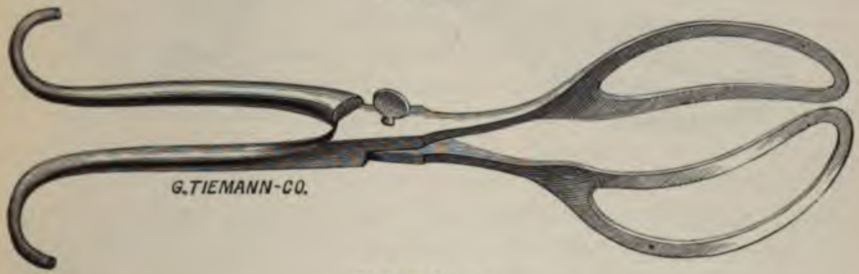
Elliott's forceps.

The forceps most used in America are Sir James Y. Simpson's (Fig. 429), Elliott's (Fig. 432), and Hodge's (Fig. 433).

Elliott's forceps has in the handle a pin which can be made longer or shorter by means of a screw. Its object is to prevent too great compression of the head. The writer may, however, state that the only fracture of the skull which has occurred in his practice happened while using this instrument. Hodge's forceps is much like Levret's. It is all made of metal, locks with a screw, has large fenestræ, and the handles end in long, curved wings. On account of the large blades it gives an excellent grip, but is for the same reason so much more difficult to apply and so much more dangerous for the mother.

Of this class of forceps the one I recommend is J. Y. Simpson's. It is fourteen inches long and has a moderate pelvic curvature and rather small blades. It has, of course, the English lock. The shanks are separated so far from each other that a finger may be placed between them for pressure against the lock, if desired. The handles have wings at the distal end, each to support one finger of the right hand, and four lateral indentations for the fingers of the left hand.

FIG. 433.



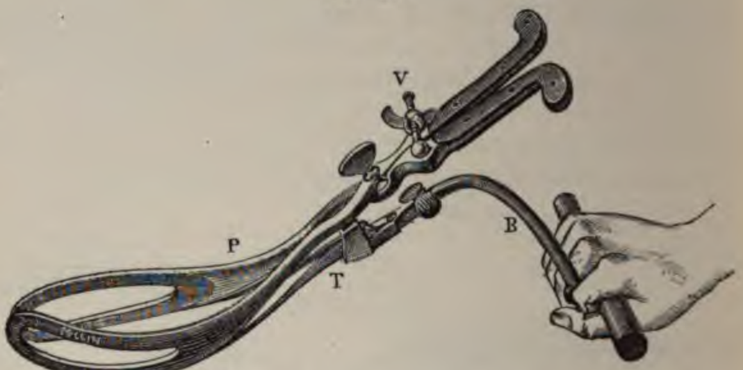
Hodge's forceps.

A new era in the history of the forceps begins in 1877, when Tarnier, of Paris, discarded all traction on the handles, which he only used for applying the instrument, whereas the traction was exercised on special traction-rods articulating with the base of the blades. At the distal end of the handles he put a screw, which with one end turns on a pivot fastened to the right branch, while the other end may be placed in a clasp, in which it is fastened by turning a wing-nut.

The inventor later modified his instrument considerably, but the principle remains the same. The idea is to use the handles as an index, showing in what direction the traction shall be made; and to execute the traction by means of separate traction-rods. The lever-screw is not destined to compress the head, but to maintain the pressure which by manual compression is found necessary to keep the grasp on the head. The Tarnier forceps (Figs. 434, 435) has two traction-rods that are fastened to the blades and end behind in hooks which enter the manubrium. The latter consists of an upper part with a strong perineal curvature and a lower transverse bar, which rotates in all directions around the former, allowing traction to be made however the forceps is applied. The upper part is kept at a distance of one centimetre from the branches, and traction is only exercised on the transverse bar.

In the writer's opinion, Tarnier's instrument is unnecessarily heavy and complicated, and is even apt to fall apart while being handled. In this country it was hailed as a valuable improvement by the late Dr. W. T. Lusk, who improved the articulation between the traction-rods and the handle.

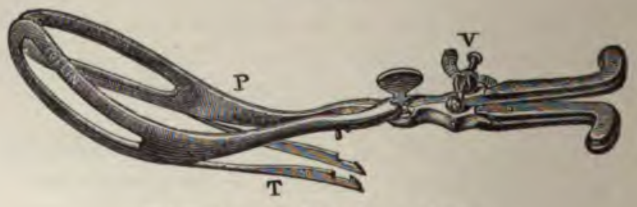
Fig. 434.



Tarnier's forceps held as used for traction.

In Scotland it gave birth to A. R. Simpson's axis-traction forceps, and in Vienna it was modified by Breus according to the views of his chief, Carl Braun. In France it was severely criticised by Pajot, but, in view of the great rivalry among Parisian authorities in the same line, that ought not to have too much weight. In Germany they are opposed to the instrument, but national prejudice has doubtless influenced the leaders. In America the instrument is little known. If

Fig. 435.



The same without the traction-handle.

the profession knew it better, they could hardly fail to adopt it, driven by the American mechanical genius and love of novelties.

The high price of the instrument when first brought out, the erroneous conception that it was adapted only for special and rare cases, and the fact that young American physicians who study in Europe much more frequently choose Germany than France for their temporary residence, may all have contributed to the indolence shown by the profession at large towards an instrument which otherwise would have strong claims on their interest and support. Personally the author has little experience with the Tarnier instrument, but, as stated above, he has used Simpson's axis-traction forceps for all purposes since its invention, and that instrument is only a practical simplification of Tarnier's. In the writer's opinion this is the forceps of our age, and the old forceps without traction-rods is an inferior instrument which should be superseded by the more perfect one which has been evolved from it. In my eyes the new instrument has two great advantages over the old: it substitutes mechanism for judgment, dexterity, and experience, which in the nature of things can only be in the possession of a few favored ones, while nearly every practitioner of medicine at some stage of his evolution is called upon to use the forceps. Secondly, it is in a wonderful degree a labor-saving machine. The application of the forceps is exactly the same whether we use the old or the new instrument, or the difference is at least so insignificant that it may be left out of consideration. Anybody who is competent to apply the old instrument can apply the Tarnier or the Simpson instrument. But as soon as we come to the traction—that is to say, to the real use of the instrument—there is the greatest difference.

With the old instrument the accoucheur has to find out where the head is in the parturient canal and constantly change the direction of the traction. If he pulls on the handles in a happy-go-lucky way, he will waste much of his force by pressing the head against the symphysis pubis, and he will be likely to bruise and tear the soft parts of the parturient canal or even cause strong ligaments to rupture or bones to break. How difficult it is to pull in the right direction appears from the very different ways in which different authors recommend to place the hands on the forceps. With the new instrument a mere tyro can perform a forceps extraction properly. He has only to follow the rule of keeping the traction-rods at the distance of one centimetre from the shanks of the forceps of Tarnier's instrument, and hold them in contact with the shanks in using Simpson's axis-traction forceps. Nothing could be simpler. As long as the accoucheur follows the rules, he is sure to pull in the right direction.

The value of the new instrument as a labor-saving machine is very marked, and must particularly appeal to men advanced in age and to female practitioners. No force being lost, and the adaptation of the hands to the handle of the traction-rods being so simple and so advantageous, a person of average strength is able to perform a forceps delivery without overtaxing himself and without being tempted to resort to an irregular and sudden display of force, involving injury to the patient and exhaustion of the physician. A. R. Simpson's axis-traction forceps (Fig. 425) is essentially the J. Y. Simpson forceps with addition of the traction-apparatus and the retention-screw at the distal end of the application-handles. Since these handles are not used for traction, the wings and indentations have been left out. Two slender, curved traction-rods are fastened to the outside of the blades, just below the fenestræ, where they are retained by a screw and nut buried in the thickness of the metal without forming any protrusion on the inside of the blade. The left rod is at its posterior end riveted to a little triangular plate. The right rod has at its posterior end a little button which fits loosely into a hole and slot on the same plate to which the left rod is riveted. At the posterior end of the plate there is another rivet allowing a limited degree of lateral rotation to compensate the deviation caused by the entrance of the above-mentioned button into the slot. Around this rivet moves a piece of steel which at the other end perforates the middle of the traction-handle, a cylindrical bar which rotates in a complete circle at right angles to the pivot (Fig. 426).

Simpson's instrument is, in my opinion, an improvement on the Tarnier forceps. It is lighter. There are no loose pieces to get out of order or become lost. The traction-rods are fastened to the blades, and still they may be removed for cleaning after the forceps has been used. The traction-handle is riveted permanently to the left traction-rod. The instrument is cheaper. There ought indeed to be a difference of only a few dollars in the price of an old-fashioned forceps and the modern instrument.

In the course of time Professor Simpson has made such modifications in his forceps as were needed in order to comply more strictly with the demands of aseptic obstetrics. The new model is represented in Figs. 436 and 437. The wooden bar has given way for one of metal, the screw-nuts have been replaced by hooks and slots, and the connection between the traction-rods and the handle has been improved so as to increase solidity and avoid loss of force. So much gain must console one for no longer having all parts of the instrument fastened to the two branches.

Action of the Forceps.—The forceps is chiefly a *tractor*. The head once seized, the accoucheur aims at pulling it out in the direction of the axis of the pelvis.

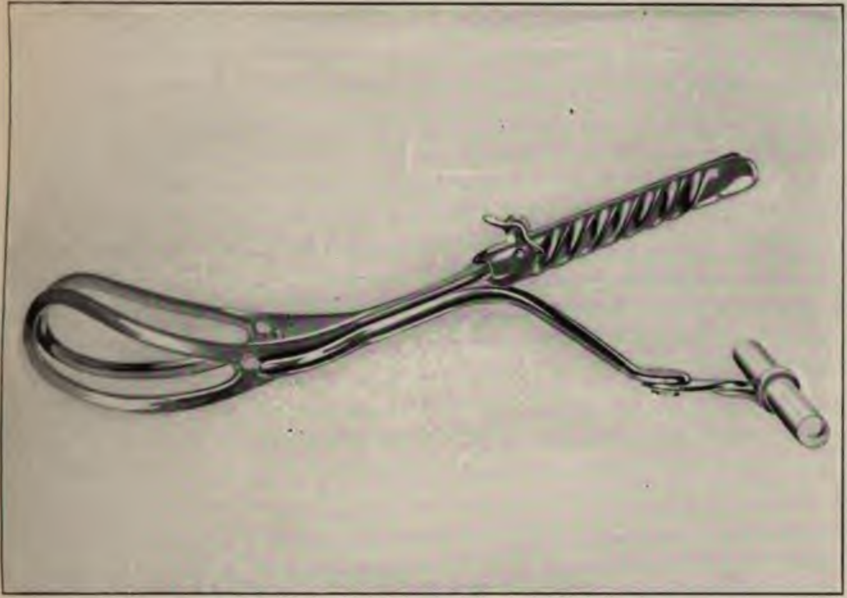


FIG. 436.—A. R. Simpson's axis-traction forceps, new model.

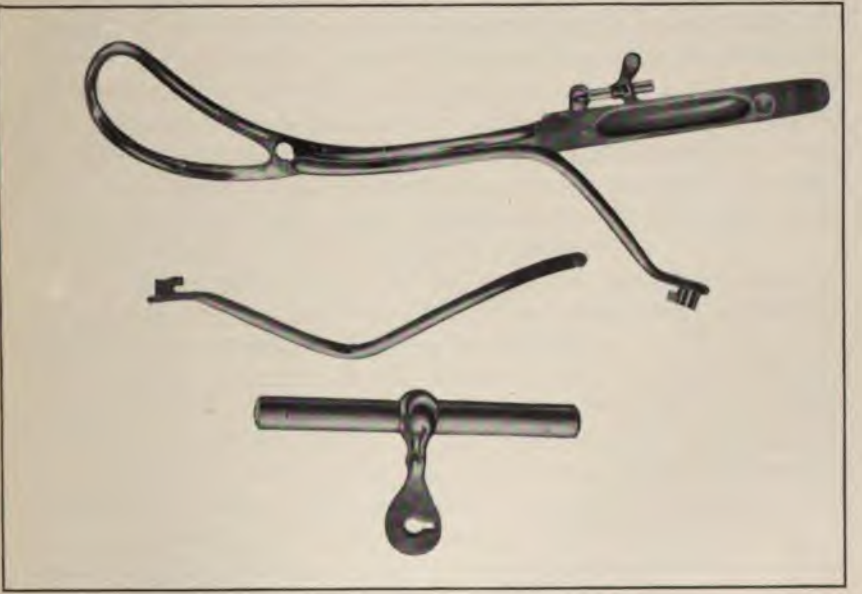


FIG. 437.—Component parts of the same.

Traction may be steady, rocking, or rotatory. The *steady* traction consists in pulling the head as nearly as possible in the line of the axis of the pelvis. With the axis-traction forceps this is accomplished by keeping the traction-rods just in contact with the shanks of the forceps, thus using the forceps itself as an indicator of the direction. With the old forceps this is a point that needs much attention. In a general way, we may say that when the head is at the brim, traction should be made in the direction of the axis of the brim; in other words, that the direction of the line of traction is backward towards the perineum. When the head is in the cavity of the pelvis, traction should be made horizontally forward towards the accoucheur; and when the head is at the outlet, the direction is forward and upward, the patient lying on her back. But it will easily be seen that these three directions correspond only to three points of the road to be traversed, and that there are innumerable transitions between them. The nearest we can come to a rule is to say that when the forceps is well applied, traction should be made in the direction of the handles.

In the *rocking*, or *pendulum*, traction, the forceps, while being pulled upon, is simultaneously moved a little from side to side. Opinions among accoucheurs, even before we had the axis-traction forceps, varied much as to the value of this rocking movement. Its defenders said it diminished friction, and pointed to the way in which we remove a tight-fitting ring from a finger or pull a cork with the fingers from a bottle. In both cases very marked benefit is derived from an alternating lateral movement. But those who were opposed to it said that if a nail has been driven into a costly table, we will try to seize it with a pair of pincers as accurately as possible at right angles and pull in a straight line, without side movements, in order to do as little damage to the surrounding parts as possible. The writer would add that he has found the rocking movement very serviceable when the head is low down, and that, executed with care, it does not do any harm, but it is undeniable that the perineum is more liable to suffer than by the steady traction.

The *rotatory* movements are not to be recommended, as they may make the forceps slip and injure the parturient canal, while they have no advantage over the rocking movement.

A secondary action of the old forceps is that of a *lever*. It may be used as a lever of the first class, the power being at the handles, the fulcrum at the lock, and the weight at the blades. But generally it is a lever of the second class, the power being at the handles, the fulcrum at the ends of the blades, and the weight between the two. This leverage comes into play when we use the old forceps and make so-called rocking traction,—that is, move the handles from side to side.

Leverage is lost in using Tarnier's forceps, but this loss is amply compensated by the much-improved traction. With Simpson's forceps I find it quite feasible to make some pendulum movements.

A third action is that of a *compressor*. A certain degree of compression is necessary in order not to lose the grip on the head; but, since the ordinary forceps all lie in the side of the pelvis, and the contraction to overcome which they are used is chiefly found in the anteroposterior direction, by compressing the head we would only increase its dimensions in the sagittal plane. Compression may also injure the fœtus, and, far from being a goal the attainment of which is to be sought, it is a danger and an inconvenience, to be limited as much as possible. For this very purpose the lock is always placed nearer to the proximal end than to the distal end.

It has been claimed that the forceps has a fourth action, called the *dynamic*. The mere presence of the forceps in the genital canal is said to call forth a reflex action, and thereby increase labor-pains, and thus indirectly further delivery; but, if at all present, this action is of very secondary importance. As the chief action of the forceps, there remains, then, that of traction.

The forceps may also be used to *change the position of the head.* For this purpose a straight forceps is best, but one with a slight curve may also be used.

Finally, the forceps may be used for *steadying the head during craniotomy;* but, as a rule, it is not necessary to use it for this purpose.

Indications for the Use of the Forceps.—These are (1) deficient uterine contractions, (2) disproportion between the size of the head and the pelvis, (3) unfavorable presentations or positions, (4) danger to mother or fœtus, and (5) torn-off head.

The forceps is most commonly used when labor-pains are too weak to finish the expulsion of the fœtus by nature's sole efforts (p. 357). Under this indication the forceps, as a rule, is used when the head is in the cavity of the pelvis or presses on the pelvic floor. This was, in the beginning, the only use made of the instrument, and the indication could be fulfilled by the short, straight forceps.

In describing the use of the forceps for mechanical disproportion, it is commonly taken for granted that the fœtus is of normal dimensions and the rules apply only to the maternal pelvis; but it is evident that similar difficulties arise whether the parturient canal is abnormally narrow or the body that shall pass through it is too large. In consultation practice the writer has often noticed that this point is overlooked. The attending physician reports that there are good labor-pains, that the pelvis seems to have the normal dimensions, but that the os will not dilate. In many such cases the fœtus is too large in proportion to the pelvis through which it must pass.

The different kinds of excessive size of the fœtus have been described above (p. 397 *et seq.*).

Supposing, then, we have to deal with a normal fœtus, the most common condition of the parturient canal calling for the application of the forceps is a contracted pelvis (p. 436 *et seq.*). But the accoucheur must bear in mind that the forceps should not be used if the true conjugate is below 3 inches (7½ centimetres) in a flat pelvis or 3¼ inches (8½ centimetres) in a generally contracted pelvis (p. 463), unless there are particularly favorable circumstances present—an exceptionally small fœtus and good labor-pains—when the limit may be brought down to 2¾ inches (7 centimetres) for the flat and to 3 inches (7½ centimetres) for the generally contracted pelvis. In all these cases it is supposed that the vertex presents and the occiput turns forward. In occipitoposterior or in brow or face presentations exceptional space is required for a successful forceps operation. If the true conjugate measures less than 2¾ inches (7 centimetres), the delivery should under no circumstances be tried by means of the forceps.

Occipitoposterior position (p. 362), occipitolateral position (p. 365), face presentation (p. 367), brow presentation (p. 364), often demand the aid of the forceps.

In breech presentation the forceps is rarely used. It may, however, be applied to the after-coming head (p. 385); but, as a rule, manual extraction is preferable as simpler and more expeditious. If the legs are extended in front of the body of the fœtus, and the breech is too high up in the parturient canal, the forceps may be applied over the sacrum and the posterior surface of the thighs or along the outer surface of the thighs (p. 390).

Dangerous conditions of the mother that call for forceps delivery are especially hemorrhage, eclampsia, rupture of the uterus, strangulated hernia, fever, or exhaustion.

In regard to the fœtus, the alarm signals consist in slowness and weakness of the pulse and expulsion of meconium in head presentation, while in breech presentation the latter is of less importance, since it simply may be due to mechanical compression of the bowels. Prolapse of the cord is particularly dangerous (p. 414).

In cases of avulsion of the head the forceps is not the real instrument wanted, more efficient help being obtainable from the cephalotribe or the cranioclast. But if these instruments are not available, the forceps combined with craniotomy may be used as a welcome substitute (p. 564).

Conditions for the Use of the Forceps.—Even when following the above-mentioned indications, the forceps should not be used unless certain conditions are present. First of all, the membranes must have broken or have been ruptured, so that the forceps can be applied directly to the head and not to the outside of the ovum, for in the latter case not only the grip would be less firm, but we might tear the placenta from the uterus and cause a perhaps fatal hemorrhage.

Secondly, the os should be fully dilated, be it by nature's sole efforts or by one or more of the means described above (p. 583). If the indication for terminating labor is very urgent, this condition may, however, be dispensed with and the necessary space be obtained by means of incisions in the circumference of the os (p. 588).

Thirdly, the head should be engaged in the brim of the pelvis; that is to say, so large a portion of the head should have passed the superior strait that the head is fastened there. As long as the head is freely movable above the brim, it is not a fit object for forceps extraction; podalic version is the operation called for. If the forceps is used to seize the head above the brim, the head will turn so as to be grasped more or less laterally, and that os frontis which is turned backward will be pressed forcibly against the promontory and be liable to become fractured (p. 460). For the mother there is the danger of great bruising of the pelvic walls with subsequent inflammation, gangrene, or paralysis, and of the forceps slipping, by which serious wounds may be inflicted. But it is fair to add that the engagement of the head is not recognized as a condition by all, some obstetricians of note preferring the forceps to version even if the head is movable above the brim. The accoucheur may try by direct pressure on the head to further its engagement, and if successful apply the forceps (p. 589).

Fourthly, the position should be distinctly made out, so as to be able to apply the instrument intelligently and to pull in the proper direction.

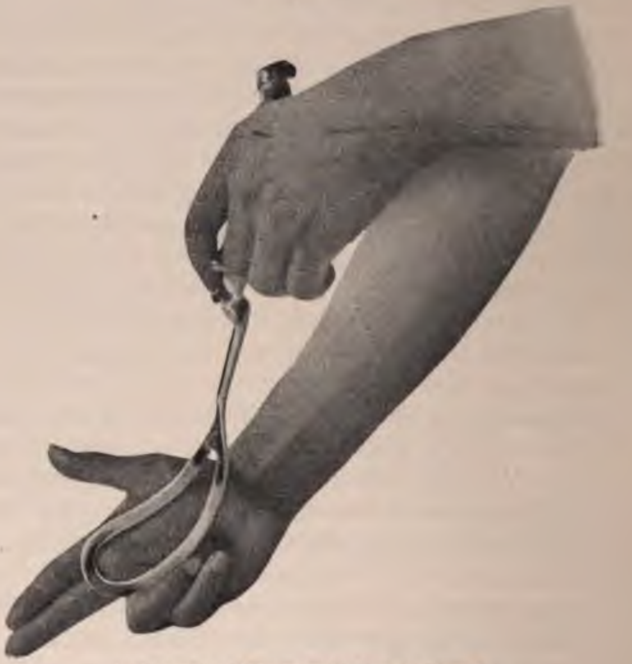
Modus Operandi.—If a difficult forceps extraction is to be anticipated, it is better to place the patient on a table (p. 590). For the more common operations, it suffices to place the patient across the bed. It is advisable to shorten the hairs growing on the labia major and the nearest of those springing from the mons Veneris with scissors. The vagina is cleaned with an antiseptic douche. The patie is anæsthetized (p. 591), unless she prefers to stand the pain, whic is preferable in so far as then the uterine contractions may work conjunction with the force exercised by the accoucheur. The patie should, as a rule, occupy the dorsal position, with bent, raised, a moderately separated knees. This, at least, is the custom in Ameri and on the continent of Europe. In England the accoucheurs pref to operate with the patient lying on her left side. But in diffic cases they have recourse to the dorsal position; and, *vice versa*, tho who usually extract on the back may occasionally derive benefit placing the patient on her left side. In such cases the hanging posture (p. 592) may also be tried.

Before introducing the forceps, the bladder should be emptied with a catheter. To overlook this is a grave fault which not only may render the operation more difficult, but may have the most serious consequences, such as rupture of the uterus, the formation of a vesicovaginal fistula, etc. When the head is more or less engaged, it may be quite difficult to pass the catheter, the urethra being compressed between the head and the symphysis pubis. Glass catheters are objectionable, because they may break and wound the patient. Male catheters of white-metal are soft and easily bent to answer any curvature. Flexible catheters are good, but should be introduced without the stylet. They do not stand boiling, and become rough in solutions of carbolic acid, creolin, or lysol. They should, therefore, be disinfected by immersion in bichloride of mercury solution. Sometimes a soft rubber catheter will worm its way into the bladder better than anything else, and it stands boiling with soda well. If the catheter meets resistance, the accoucheur should beware of using force, lest he perforate the urethra. In such cases another instrument should be tried, and often it is possible by pressing the head of the fœtus upward in the direction of the pelvic axis with the left hand to obtain the room necessary for the passage of the catheter with the right.

The forceps should be sterilized by boiling in soda solution (p. 594) for a few minutes. It is lubricated by immersion in creolin or lysol solution. The obstetrician stands at the end of the table or sits at the bedside on a chair, as described on page 590. The left or lower blade is introduced first. It is seized with the left hand like a pen, and held between the thumb on the inside of the handle and the index-finger above and the middle finger below the wing. The two other fingers may either be held parallel to the middle finger or bent against the hollow of the hand (Fig. 438). The beginner may derive some benefit by retaining the rule in his memory that everything shall be left except the obstetrician. The index and middle finger of the right hand are stretched out, introduced inside of the os, and applied as high up as possible on the head. Next, the point of the left blade is held against the base of the volar surface of the two fingers, which are used as a guide for the instrument. At first the handle is held in the direction of the right groin, and gradually it is lifted and brought forward and over towards the left side of the woman, and, finally, backward. During this whole introduction the point of the forceps is slid along the furrow between the two fingers.

When the forceps reaches the head, the accoucheur should in his mind's eye see the cephalic and the pelvic curvature, and guide the instrument in the direction of the combination of the two. As a rule, he tries to keep it at the end of the transverse diameter of the pelvis, but often the instrument enters a little farther back. He then seizes the handle with the full hand, and by a rotatory movement brings it forward until it lies in the transverse diameter. He then requests an assistant to take hold of the handle, passing his hand under the patient's left knee, and hold it in the same position, while he applies the second, upper, or right branch of the forceps. This is a little more difficult to do than to apply the first, there being now less space. The second branch is applied in exactly the same way as the first, only it is seized with the right hand and inserted into the right side. When both branches are introduced, the accoucheur holds each of them with the full hand, and makes such changes in their position that they can be easily *locked*,—that is to say, that the two halves of the lock are brought in perfect contact. If he does not succeed in this, the second branch should be withdrawn and reintroduced in a more appropriate direction. Before locking the forceps the accoucheur should pull gently on the branches, to satisfy himself that their cephalic curvature corresponds to the head. In pushing the right

FIG. 438.

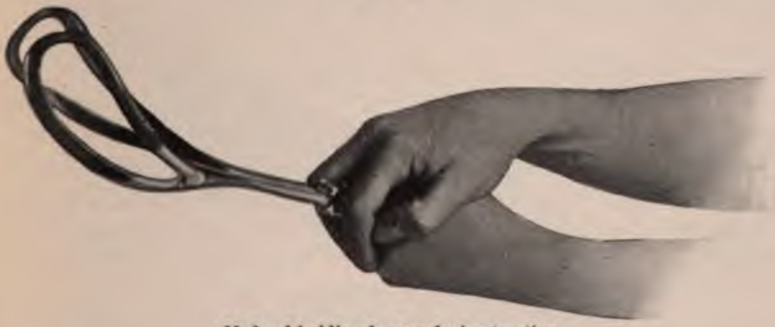


Left branch of forceps guided by right hand.

branch into the left he should use his index-fingers to hold pubic hairs and folds of the vagina out of the way. When the forceps is locked the operator should again make a slight traction on them, to satisfy himself that the instrument lies properly.

During traction the handles are kept together by the left hand passed around them, the back of the hand pointing downward and the thumb lying above them. The chief traction is made with the right hand, the index and the middle finger pulling on the wings, the thumb resting below the wing of the left branch and the ring-finger and little finger occupying a similar position under the right wing and the fingers of the left hand (Fig. 439). Some prefer, however, to apply the left hand at right angles to the shanks just above the lock, so as to exercise downward pressure with the ulnar edge, and form a fulcrum around which the instrument moves (Fig. 440).

Fig. 439.



Mode of holding forceps during traction.

Before beginning to pull the accoucheur should notice how much of the forceps remains outside the vulva, where the lowest point of the head is in relation to the parturient canal and in relation to the lowest point of the fenestra. The first two points will enable him to watch the progress made during extraction, and the last will warn him in time if the forceps begins to slip off from the head.

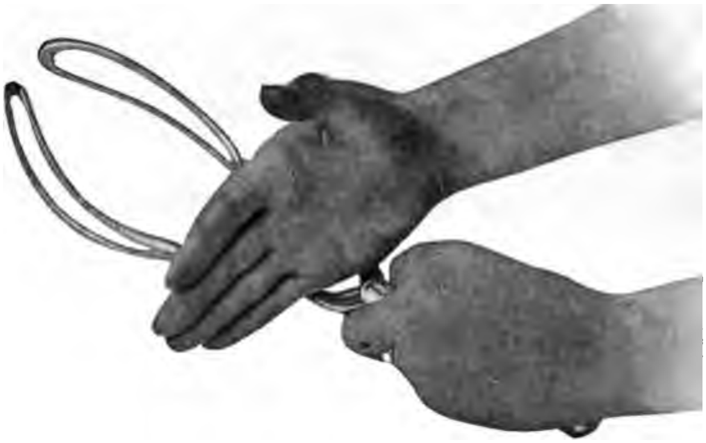
The *direction* in which traction is to be made depends on how far the head has descended in the parturient canal. When it is high up, the direction is downward towards the perineum; when it is in the cavity, the direction is horizontal towards the obstetrician; and when it is at the outlet, the direction is straight upward.

If the woman is not anæsthetized, if labor-pains are present, and there is no particular hurry, traction should be made during the pains and interrupted during the interval. And even if an anæsthetic is used, traction should be made much as uterine contraction acts,—that is to say, it should begin slowly, then increase in strength, and thereafter again slowly decrease. In this way the walls of the genital canal are gradually prepared to let the fœtus pass, and the fœtus is much less liable to be injured. Each such traction should last about a minute, and be followed by a pause, during which the forceps is held loosely, so as to allow it to recede partly and to permit the head to turn inside of the blades.

During the tractions and in the intervals it is well frequently to introduce the index-finger into the vagina in order to ascertain how much progress has been made, whether a swelling is forming on the head, or the blades begin to slip.

When the largest circumference of the head is at the rima pudendi, I take off the forceps and enucleate the head by pressure through the rectum, as described above (p. 193). By so doing we gain the space occupied by the forceps and the head may be brought out with greater care than when the extraction is finished with the forceps.

FIG. 440.



Another way of holding the forceps.

Sudden or violent movements should be carefully avoided. The strength of a man of ordinary muscular development is all that is required and can be borne without damage. The accoucheur should use only his arm muscles, and not employ the weight of his body as traction force by throwing himself back, whereby he loses all control over the instrument. If the extraction is made while sitting, only a weak man should brace himself by pressing one foot against the side of the bedstead, never both.

During traction an assistant should press with both open hands on the fundus, so as to push the fœtus against the brim of the pelvis (p. 589).

When the operator wants to remove the forceps, he separates its branches by opening the lock and moves the handle of the upper branch in a circle in the direction of the left groin. When this branch is withdrawn, he removes the left branch in the opposite direction.

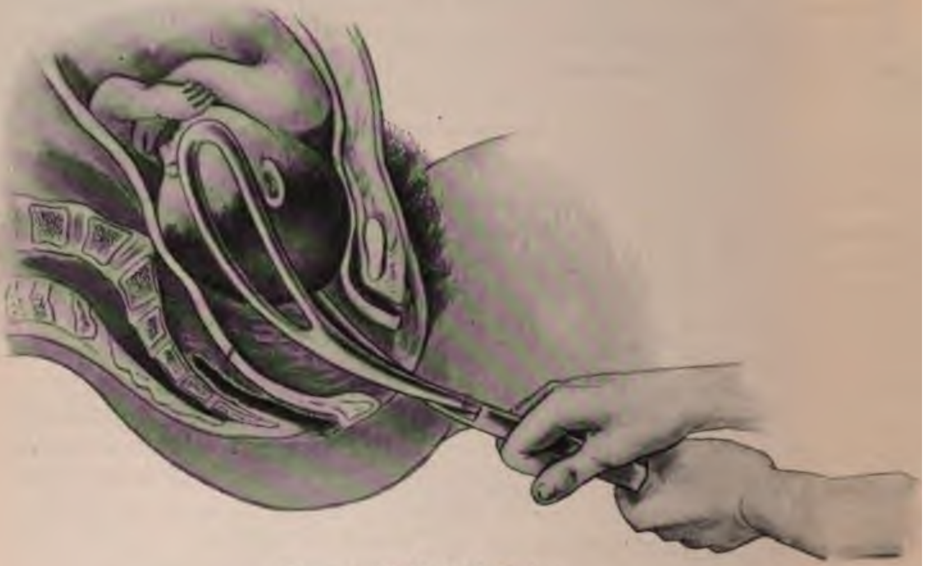
When the head is born, the operation proper is finished, but the same conditions which indicated the use of the forceps may call for help in the delivery of the shoulders and the rest of the body. In this respect pressure from above may again offer valuable help. But traction from below is often required in addition. The head may under no circumstances be used for pulling. All that is permissible is to seize it between the two flat hands and alternately press it downward and upward, beginning with the downward motion. As soon as feasible, one or both index-fingers are hooked over the armpit. The accoucheur should help that shoulder out first which is lowest,—as a rule, the anterior,—but if he meets with resistance, it is better to try the other first.

If the cord is wound around the neck, it is liberated as in normal deliveries (p. 194).

When the shoulders have appeared, it may still be necessary to pull on the body until the breech has passed, after which the lower extremities follow easily. At this stage it is convenient to haul the patient a little back from the edge of the bed, so as to find room to place the baby on its back between her legs, across her genitals. If the child is in a good condition, we wait to tie the cord until it has cried and the pulsation in the cord stops; but frequently the child is asphyctic, when we should tie and cut the cord without delay and take proper measures for its revival (p. 559), while an assistant holds the uterus of the mother compressed in order to prevent hemorrhage. When the accoucheur is through with the child, he returns to the mother, expresses the placenta and removes the membranes. If there is any tear of the perineum, which is quite common in forceps operations on primiparæ, he sutures it, and finally the patient is cleaned and bandaged as in normal cases.

How the Forceps Grasps the Head.—As stated above, as a rule, we place the branches of the forceps laterally, at the end of the transverse diameter of the pelvis. Since now the head occupies a different position in relation to the pelvis as it descends, passing all the way from the transverse to the anteroposterior diameter, it will of necessity be grasped differently by the forceps at different depths of the parturient canal. If it were grasped right in the beginning of its descent, the forceps would come to lie with one branch on the occiput and the other on the face, which is undesirable. But nearly always the long axis of the head will be in a somewhat oblique diameter of the pelvis, and the forceps, adapting itself more easily to the sides of the head than to the occiput and face, will help to turn it into the oblique diameter. When under these circumstances the forceps is applied in the transverse diameter of the pelvis, it must of necessity seize the head obliquely, one branch lying on the temporal and frontal region (Fig. 441), touching or perhaps even surrounding the eye, and the other covering part of the parietal and occipital bone of the opposite side.

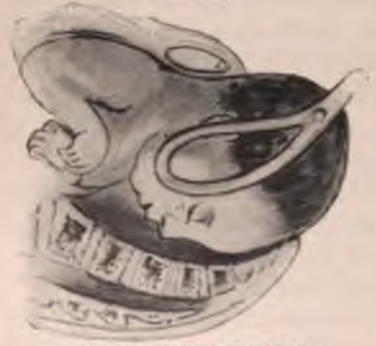
Fig. 441.



Forceps applied to head at brim.

On the other hand, when the head has turned into the antero-posterior diameter, it will be seized laterally, the fenestræ surrounding the parietal eminence and the ear (Fig. 442).

Fig. 442.



Forceps on head at outlet.

If the head is low down, but still in an oblique diameter, the forceps may be applied to these portions of the head, and consequently be placed in the oblique diameter of the pelvis, from which position it will rotate towards the transverse diameter, just as the head rotates into or near to the anteroposterior diameter in normal deliveries.

For clearness' sake, we have so far given an uninterrupted description of the forceps operation in a common vertex presentation, but it will now be necessary to advert to some difficulties which are frequently met with in this operation.

Even in cases in which a speedy delivery is indicated, the operator should insert the forceps deliberately and carefully. If its point s caught by folds of the vagina or of the scalp, he should beware of ushing on the instrument until he with his fingers has removed the bstacle.

The head may be so impacted—that is, in such close contact with e sides of the pelvic wall—that there is not room for the branches the forceps at the ends of the transverse diameter. Then the first anch should be introduced farther backward, in front of the iliocral articulation, where there is more space. When once it is serted it is generally possible by small movements to and fro to ing it forward to the normal place. If this is not possible, the cond blade must be introduced more forward, in the region of the opectineal eminence, in order to correspond to the first.

Finding more space behind, the blades of the forceps may slide in is direction, which is indicated by the wings turning forward. Then e instrument cannot be locked, but, as said above, by gentle move-ents, the accoucheur will, as a rule, succeed in replacing them at e end of the transverse diameter of the pelvis. For this purpose seizes the handles with the full hand and moves them backward the direction of the perineum, and imparts simultaneously a rotary movement to them, so as to bring the wings back.

More rarely the blades deviate forward, when the wings point ckward. Then the replacement is executed by lifting the handles d rotating them forward.

If the obstetrician does not succeed in locking the forceps, he ust remove one or both branches and apply them anew.

In judging of the place occupied by the head before applying the rceps or of the progress made during traction, the operator must ware of being deceived by the presence or formation of *caput suc-daneum*, which may make him believe that the head is much lower wn than it is in reality. The swelling of the scalp, being softer an the skull, is more elastic, and can be more or less indented.

After the forceps has been locked, it may show a *tendency to open*. This shows that an elastic mass is seized by the points of the rceps—namely, that they press on the neck of the fœtus, which ght to be avoided. When the neck is seized with the forceps, action is made on the head and trunk together as one object, which pedes the movements of the head. The forceps may also do harm compressing the cervical blood-vessels, or the umbilical cord, if it is wound around the neck, or may fracture the clavicle. Under such circumstances the instrument should be taken out and reapplied in another direction, depressing or lifting the handles more than in the first attempt.

During traction the forceps may *slip*—that is to say, lose its grip on the head. If this takes place suddenly, the operator may fall on his back, holding the disengaged instrument in his hands, a disgraceful accident, that will cover the accoucheur with blame and ridicule, and may inflict serious wounds on the patient.

The slipping may be perpendicular or horizontal. It is called perpendicular if the forceps slides along the sides of the head more or less in the direction of the pelvic axis, and horizontal if the blades deviate forward or backward in the pelvis. The cause of the perpendicular sliding is an imperfect application of the forceps to the head. If too small a part of the head is seized, the instrument will slide down when traction is made. The same will happen if the forceps is used on the head of an immature fœtus so small that it does not fill the space between the blades. Traction in a wrong direction is liable to produce horizontal sliding. In perpendicular sliding the distance from the lower end of the fenestra to the head increases, and the handles become more separated from each other. In horizontal sliding they become, on the contrary, more approximated. When any of these signs warn of the impending danger of slipping, the condition should be cleared up by a vaginal examination, and the forceps reapplied.

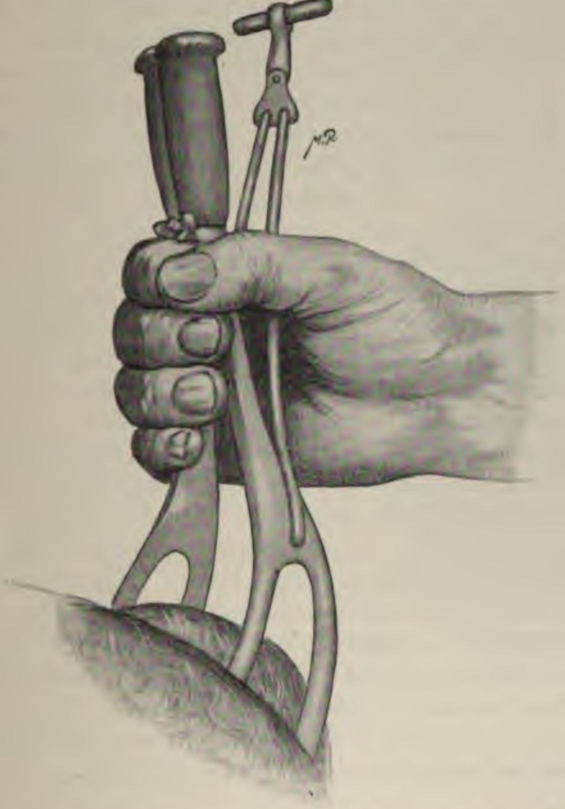
In difficult cases it may not be sufficient to introduce two fingers into the vagina as a guide for the forceps. Then we may sometimes succeed in applying it by using all four fingers, the so-called half-hand, or even the whole hand.

How the forceps is used in the unusual positions and presentations has been described under the treatment of each of them.

Application of Simpson's Axis-traction Forceps.—For introducing Simpson's axis-traction forceps, the traction-rods are pushed forward in front of the shafts and held together with the handles. The forceps is held exactly as described above. When both branches are in place, the traction-rods are pushed back behind the shafts. The screw is not used for compressing the head, but for holding the handles against each other, and is turned sufficiently to keep them in place. In the interval between tractions it may be loosened. After the rods have been brought back and the screw is in place, the handle is attached. In making traction the traction-rods should be in contact with the shanks. Traction is made by seizing the transverse bar with the right hand from above, two fingers on each side and the thumb below.

If the accoucheur wishes to finish the whole extraction of the head with the axis-traction forceps,—be it Tarnier's or Simpson's,—he should let go of the traction-handle when the largest circumference of the head is in the vulva, and hold the traction-rods together with the shanks of the forceps with the full right hand, the thumb turning upward. By so doing he can prevent a too sudden escape of the head and help it out with small, cautious movements (Fig. 443).

FIG. 443.



Axis-traction forceps held with full hand in delivery of head.

To remove the forceps, the button of the traction-rods is freed, the crew and the lock are opened, and the branches are withdrawn as in sing the old forceps.

High, Middle, and Low Forceps Operations.—If the forceps is aplied to the head at the brim, it is called a high operation; if the head s at the outlet, it is called a low operation, and if the head is in the avity of the pelvis, it is called a middle operation.

Anæsthesia.—Most women prefer to be anæsthetized for a forceps operation, and, as the pain is considerable, it is proper to comply with their wish; but if the patient does not care it is better not to use an anæsthetic, as then uterine contractions work in unison with the traction exercised by the accoucheur. If the patient is very weak and the speediest delivery is indicated, it is preferable not to anæsthetize her.

Prognosis.—The prognosis in forceps operations differs much in different cases according to the indication for the use of the instrument. If this is mere inertia uteri and the head is low down in the parturient canal, the operation is easy, and the prognosis for mother and fœtus is good. But if there is a disproportion in the size of the pelvis and the fœtus, if there is an unfavorable presentation or position, and if the presenting part is still high up in the pelvis, the operation becomes more or less difficult, dangerous, or impossible; but, upon the whole, the forceps should be looked upon as a beneficent adjuvant in abnormal labor.

In an otherwise excellent text-book of obstetrics of recent date, representing one of the German university clinics, it is stated that the forceps was used in only 2.75 per cent. of cases. In my opinion it is called for three times as often, and I cannot look upon it as "a dangerous instrument," but it should be used only when indicated and when the above-mentioned conditions are present.

Still, it is undeniable that a forceps operation, as well as most other operations, is accompanied by certain dangers, which the operator should bear in mind. For the mother the chief dangers consist in contusions and lacerations of the soft parts and hemorrhage. If the forceps is applied before the os is fully dilated, deep lacerations of the cervix may occur. The convex edge of the blade is apt to wound the posterior wall of the vagina. The perineum is often more or less torn, especially in primiparæ, but with proper care the laceration does not extend into the rectum and is easily repaired. The perineum is particularly liable to injury if the head is totally extracted with the forceps, instead of using enucleation, as we recommend whenever it is practicable.

Pressure against the walls of the pelvis may result in the formation of a hæmatoma or produce gangrene. When it implicates the bladder and the urethra, it may cause paralysis of the sphincters or detrusor, with incontinence or retention. The forceps rarely wounds the base of the bladder. The vesicovaginal fistula that sometimes follows forceps operations is the result of the pressure of the head against the symphysis. This contusion leads to gangrene, and when the mortified plug is expelled there remains a fistula. A timely use of the instrument is a preventive of this untoward accident, and as a matter of fact vesicovaginal fistulæ have become much rarer since the forceps is used more frequently.

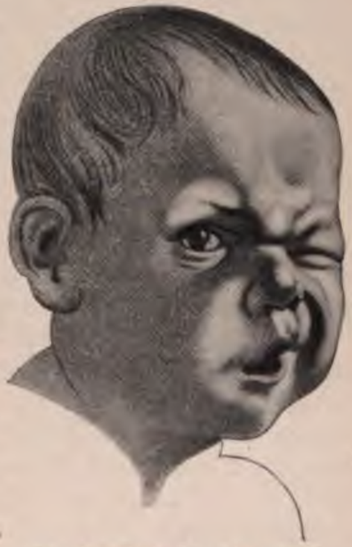
Pressure on the sacral plexus may cause paralysis or contracture of the legs, but it would be unjust to blame the forceps for it. Quite the contrary, it is well known that a greater pressure of short duration causes less harm than a protracted one of lesser degree. It is the lack of space and not the forceps that causes the injury. Rarely the strong ligaments of the pelvis are ruptured or the bones broken.

Serious hemorrhage may immediately follow the operation. It may be due to deep lacerations of the cervix, the vagina, or the perineum, or it may come from the interior of the womb, the lower part of the placenta becoming detached and uterine contraction being deficient.

There are also dangers for the fœtus in forceps extraction. The soft parts, especially the scalp, may be wounded, and by neglect of cleanliness this may lead to erysipelas, cellulitis, or gangrene. The bones of the skull may be fractured. Intracranial hemorrhage may occur, with or without such fracture. Blood is also sometimes found extravasated in the abdomen, especially in the suprarenal capsules.

In dressing wounds of new-born children the accoucheur should abstain from the use of poisonous substances, such as corrosive sublimate, carbolic acid, or iodoform. But saturated solution of boric acid and enzymol diluted with four or five times its bulk of water are safe and useful in keeping off infection and promoting granulation.

FIG. 444.



Facial paralysis of new-born child. (Ahlfeld.)

If the blade of the forceps contunds the trunk of the facial nerve, the child may be born with facial paralysis (Fig. 444), which is apt to scare the friends and may interfere with suckling, but otherwise is of little importance, as the distortion usually disappears spontaneously in a week or two. Some think that the compression of the brain during a difficult forceps operation may be the cause of epilepsy or idiocy.

THE OBSTETRIC VECTIS.—Before the obstetric forceps was known obstetricians often employed an instrument called a vectis. It was much like one blade of a straight forceps, and was used as a lever. It has nearly everywhere been replaced by the forceps, and may be regarded as obsolete.

CHAPTER XI.

VERSION.

Obstetric version, or turning, is an operation by which the fœtus is moved around its transverse axis so as to replace the presenting part by another chief portion of the body.

A mere correction of the presentation, as when we change a brow presentation into a vertex or a face presentation, is not a version. Nor is it a version if in a breech presentation we pull one leg down. But if we substitute the head or the breech for the shoulder, or the pelvic end for the head, then we turn the child in the obstetric sense of the word.

The aim is to bring the fœtus into a longitudinal presentation and make its head, its breech, or its feet occupy the os.

According to this difference of object we have three *kinds* of version. The operation is distinguished as *cephalic version* when the head is made to present, *pelvic version* when the breech is placed at the brim of the pelvis, and *podalic version* when an artificial footling presentation is substituted for a head or a cross presentation.

Version may be accomplished by different *methods*,—the *external* method and the *internal* method. The latter is again subdivided into the *digital* and *manual* methods.

External version is performed with both hands outside the uterus; in internal digital version one or two fingers enter through the os, and the remainder of the hand lies in or outside of the vagina; while in internal manual version the whole hand is inserted into the uterus.

§ 1. **Version by the external method** may be executed towards the end of pregnancy or during the beginning of labor before there is any dilatation of the cervix. To substitute a head presentation for a breech presentation is hardly possible, but to change a cross presentation into a longitudinal presentation by this method is, as a rule, not difficult. If feasible, we bring the head down and the breech up, but if that cannot be done, much is gained by changing the transverse presentation into a pelvic presentation.

When through abdominal and vaginal examination we have found that there is no part presenting, and that the head lies in one of the sides of the abdomen, we place the patient on her back with moderately flexed and separated lower extremities, so as to have as little tension of the abdominal wall as possible. With slightly curved hands we seize the two poles of the fetal ovoid and try to press the breech up and the head down over the pelvic brim. If this does not prove possible, we reverse the direction of the movements, and endeavor to push the head up to the diaphragm and the breech down to the entrance of the pelvis.

When thus the fœtus is placed longitudinally, we must strive to keep it in its new position, which often is more difficult than to bring it there. The woman must stay in bed and lie on her back. Two towels are tightly rolled into hard cylinders and applied to each side of her abdomen, where they are kept in place by a binder pinned tightly in front. If the woman is in labor, the new position may be secured by rupturing the membranes.

During pregnancy a similar result has been obtained by a chiefly postural treatment. For this purpose the woman is placed on that side where the lowest pole of the fetal ovoid is, be it head or breech, and friction is exercised on the opposite pole in ascending direction.

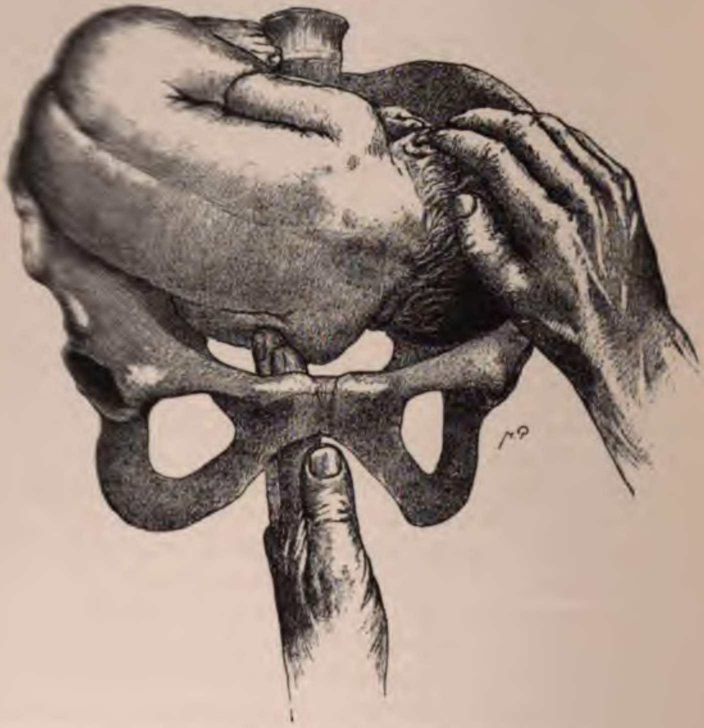
§ 2. **Version by the Internal Digital Method.**—While the external version has its time when the cervix is closed and the membranes unruptured, or at least so recently ruptured that most of the liquor amnii remains in the ovum, if a single finger can pass the cervical canal we enter on the domain of the internal digital method. This method is commonly known as *Braxton Hicks's method*, so called in honor of its inventor, the late London obstetrician of that name, or as the *bipolar method* or the *combined internal and external method*. The two last denominations are, however, objectionable as misleading. In all methods we act on the two poles of the fetal ovoid, and in the so-called internal method we use the outside hand in performing the operation.

Braxton Hicks's method, like that by external manipulation, can be used only when the membranes are unruptured or recently ruptured, so that the fœtus is easily movable. It may be employed both for cephalic and podalic version.

Modus Operandi.—If the object is to perform cephalic version, the patient is placed on the left side, with the head bent well down and the knees drawn up. For the introduction of the hand the lubricity afforded by creolin or lysol is hardly sufficient. The accoucheur should smear the dorsal surface of his hand with a stronger lubricant, such as sterilized olive oil, albolene, lubrichondrin, or white vaseline, in soft metal tubes. To use oil, lard, butter, and similar greasy substances as found in the houses or vaseline kept in a glass or a galipot is objectionable on account of the danger of infection. Next, the accoucheur spreads the vulva wide open with the fingers of his right hand and bends the left hand so as to form a cone, which he introduces into the vagina. Sometimes it is not even necessary to introduce the whole hand, three or four fingers being found sufficient, so that the thumb and the little finger may remain outside. The index-finger and, if there is room enough, the middle finger, too, enter through the os and push the presenting shoulder in the direction of the breech. At the same time pressure is exercised from without with the other hand on the head, which then glides down over the os (Fig. 445).

In placing the head over the brim care should be taken to rectify any tendency to face presentation. It is well, if the breech will not rise to the fundus readily after the head is fairly in the os, to withdraw the hand from the vagina and with it press up the breech fro the exterior. The hand which is retaining the head from the outsid should continue there for some little time till the pains have insure the retention of the fœtus in its new position and the adaptation of the uterine walls to its new form. Should the membranes be perfect, it is advisable to rupture them as soon as the head is at the os uteri.

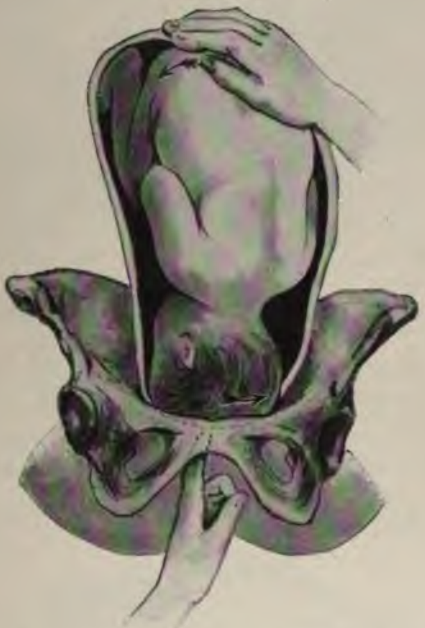
FIG. 445.



Cephalic version by Braxton Hicks's method.

For podalic version the procedure is somewhat more complicated. The best way is to place the patient on her back with bent knees, as this gives the freest play to both the accoucheur's hands. Next, we introduce that hand the volar surface of which corresponds to—that is, will most easily come in contact with—the abdominal surface of the fœtus. Thus, if in a head presentation the back of the fœtus is turned to the left (first and fourth positions), the left hand is used, and if it is turned to the right (second and third positions), the right hand is chosen. Supposing we have a left occipito-anterior position of a vertex presentation. The first step is to push the head away from the brim into the left iliac fossa (Fig. 446) with the fingers of the left hand, while the right hand from without presses the breech in the opposite direction. The head slides out of reach, and the shoulder arrives at the os and lies over the tips of the fingers. This is also pushed aside by the internal fingers in the same direction as the head, downward pressure being kept up on the breech (Fig. 447) until a knee comes within reach of the fingers, when the membranes, if still unruptured, are broken, and the knee is seized and pulled down through the os (Fig. 448), while the outer hand is shifted over on the head, which it pushes up from the iliac fossa.

Fig. 446.

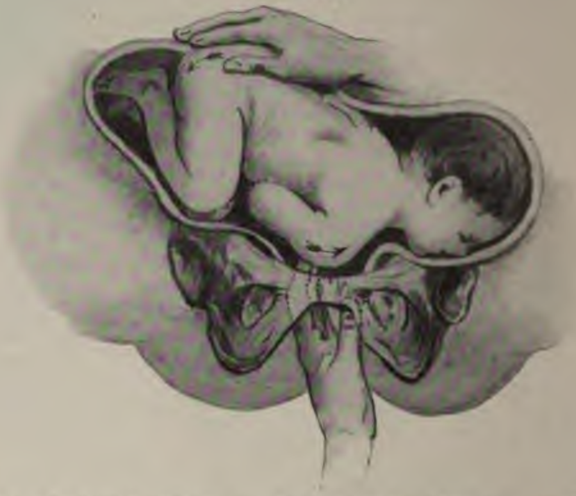


First step in digital podalic version in head presentation. Elevation of the head and depression of the breech.

Occasionally instead of a knee a foot comes immediately over the os, when it is seized and pulled down (Fig. 449). While the leg is being pulled down in the axis of the pelvis, the fœtus by nature's own efforts rotates so that its back turns forward (Fig. 450).

The method of Braxton Hicks is of particular value in cases of hemorrhage due to placenta prævia (p. 496), the condition for which it was invented. It offers the immense advantage, that if the cervix

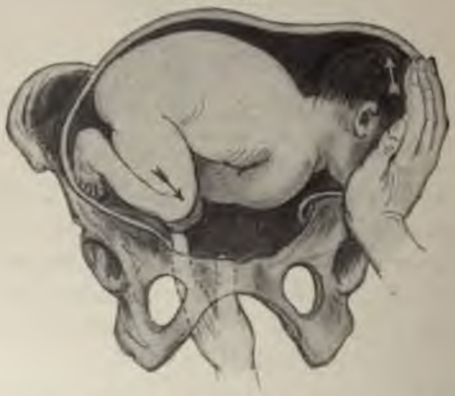
FIG. 447.



Second step in digital podalic version. Elevation of shoulder; depression of breech.

is not dilated or dilatable enough to let the hand pass, we may still be able to turn the fœtus, and with two fingers—or, if we can hook it into the popliteal cavity of the presenting knee, even with one finger—pull down a leg. The leg and a buttock serve as a tampon

FIG. 448.



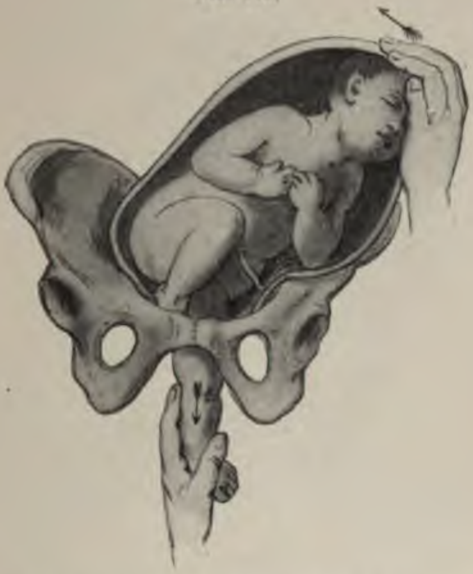
Third step in digital podalic version. Seizure of a knee and elevation of the head.

by compressing the bleeding site in the lower uterine segment from which the placenta has been detached, and extraction should therefore not be made until the cervix is fully dilated, when, if needed, other means of arresting hemorrhage may be used.

Another reason for thus postponing delivery is to avoid the dangerous lacerations of the undilated cervix.

The internal digital method may also be used in cases in which the os is well dilated, if the membranes are intact or recently ruptured; in other words, when the fœtus is freely movable; and in former times it was a great point that the uterus was hardly entered. But with our present means of disinfection this feature has lost much of its importance, and, the method being more complicated and slower than the internal manual version, it will hardly be used when the latter is available.

FIG. 449.



Fourth step in digital podalic version. Drawing the leg down and pushing the head up.

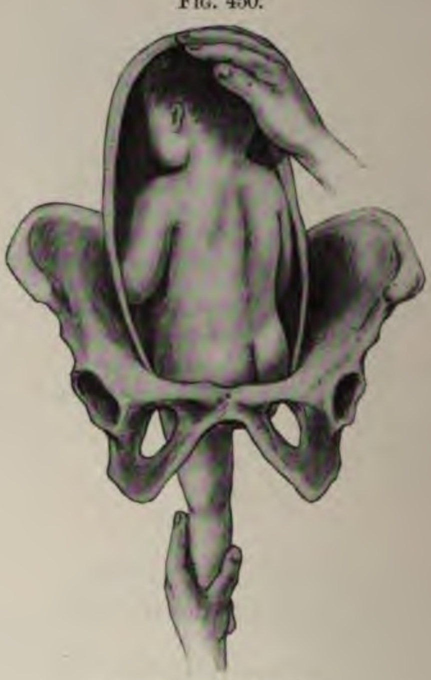
§ 3. Version by the Internal Manual Method.—This method practically dates from the French surgeon Ambroise Paré (1550). In this method the whole hand and often part of the forearm are introduced into the uterus. It presupposes, therefore, that the os is dilated or dilatable enough to let the hand pass. It may be used for cephalic, pelvic, or podalic version. The other hand is always used in coöperation with the internal hand. The hand that is to be introduced into the uterus is anointed on its dorsal surface, and so is the lower half of the forearm. Other details differ in different kinds of version, and will be considered in connection with them.

§ 4. **Cephalic Version.**—Since it is normal for the child to be born head first, and since it is much safer for it to come into the world in this way, it would seem natural also in the operation of turning to favor this arrangement. Still, there are so many limitations to its practicability that it is not used much.

Cephalic version is *indicated* in transverse presentations if the head lies lower than the breech.

Conditions.—First. The membranes must be unruptured, or recently ruptured, so that the fœtus is rather freely movable. If the waters have drained off, and the uterus has contracted around the fœtus, this kind of version is contraindicated.

FIG. 450.



Completed digital version.

Second. There must be good labor-pains. In twin labors it happens often that uterine contractions become weak after the birth of the first child, and then podalic version is to be preferred.

Third. The pelvis must not be contracted, or at least only very little. With the higher degrees podalic version is to be preferred.

Fourth. There must be no dangers threatening mother or child, for with cephalic version we cannot at any moment finish labor, as we can with podalic version.

METHODS.—*First. Postural Treatment.*—If the membranes are unruptured and the head has only deviated a little to one side, it may be brought over the superior strait of the pelvis by simply placing the woman on that side, the effect of which is to make the fundus uteri with the pelvic end of the fœtus by gravity tip down on this side, and consequently to move the lower uterine segment and the cervix in the opposite direction.

The effect of this position may still be enhanced by placing a bolster under the patient in such a way that it exerts direct pressure on the deviated head.

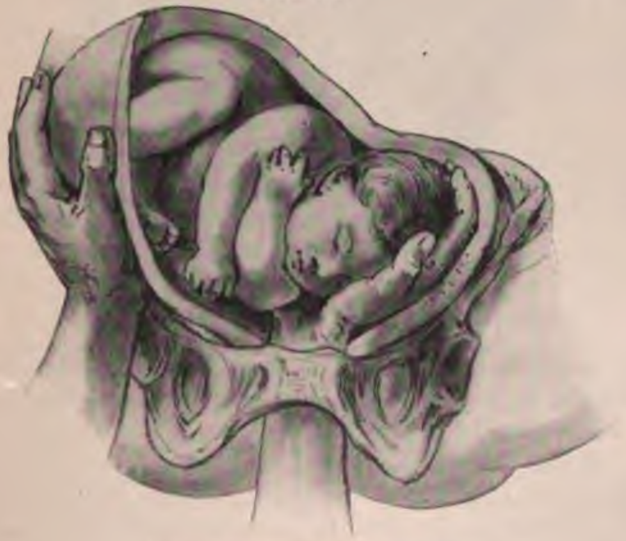
Second. Cephalic version may, as we have seen above, be accomplished by the external method.

Third. We have seen that it can be done according to the internal digital method.

Fourth. It may be obtained by different varieties of the internal manual method,—Busch's and D'Outrepont's methods.

(*a*) *Busch's Method* (Fig. 451).—The patient is placed on her back. The accoucheur chooses the hand heteronymous to the position of the head—the right hand when the head lies in the left side, and the left hand when it lies in the right side. With this hand he enters the uterus, ruptures the membranes, seizes the head and draws it over the os.

FIG. 451.



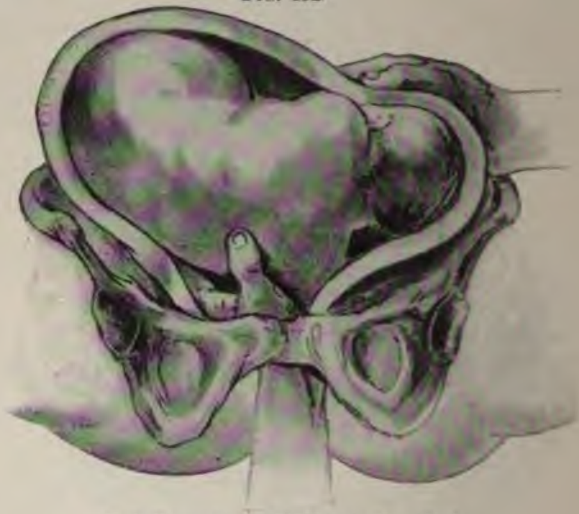
Cephalic version by Busch's method.

(*b*) *D'Outrepont's Method* (Fig. 452).—In this method the attack is directed against the presenting shoulder. For this purpose the accoucheur introduces the hand homonymous to that side in which the head lies—the left hand when the head is in the left side, the right when it is in the right side. He seizes the shoulder between his thumb and fingers, lifts it and pushes it over in the direction of the breech. Simultaneously the other hand from without pushes the head from the iliac fossa to the brim of the pelvis.

This method can even be used when the fœtus has less mobility than that required for external version or Busch's method.

When the cephalic version has been accomplished, in whatever way it may be, the permanence of the obtained results should be secured. The head should be held over the brim until uterine contractions, aided by our own pressure on the head, engage this in the pelvic entrance.

FIG. 452.



Cephalic version by D'Outrepont's method.

If the membranes are unbroken and the os is dilated, the bag of waters should be ruptured, but in so doing the fetal head should be pressed well down, in order to prevent the umbilical cord from prolapsing. If this accident happened and the os were not dilated, the life of the fœtus might be jeopardized. Before the membranes are ruptured pressure on the head has not much effect in engaging it in the superior strait, but after the waters have broken we can materially aid nature by this means.

§ 5. **Pelvic Version.**—Pelvic version consists in turning the fœtus in such a way as to bring the breech over the entrance to the pelvis. It is not much used. In fact, it is only resorted to because under given circumstances we cannot do better. Thus, it is indicated in transverse presentation if the os is not much dilated, the breech is lowest, and it is not possible to bring the head down. In this case the external method is used.

Pelvic version may also be performed if in internal version it is impossible to reach the foot or the knee. Then it may perhaps still be possible to draw the breech over the pelvic brim by hooking the index-finger over the groin of the fœtus or by inserting it into the rectum.

§ 6. **Podalic Version.**—In this kind of version a transverse or head presentation is changed into a footling presentation. We have seen above that under favorable circumstances this can be done by the internal digital method. But much more frequently podalic version is performed by means of the internal manual method, which presently will be described.

Indications.—Podalic version is indicated under the following circumstances:

First. When a change of presentation is absolutely necessary for the accomplishment of delivery,—namely, in transverse presentation after the end of the first six calendar months of pregnancy. Before that time the fœtus is small and soft enough to be expelled by spontaneous evolution (p. 394). Even after that period we may exceptionally leave the case to nature,—namely, when the fœtus is dead, the pelvis large, and gestation not far advanced. But the rule is, with transverse presentation during the last three months of gestation, to turn, and, except in the special cases mentioned above, to use podalic version by the internal manual method.

Second. Podalic version is indicated also in head presentation when there is reason to believe that the chances for a safe delivery will be bettered by changing the head presentation into a foot presentation. Thus, podalic version may be indicated in cases of face presentation (p. 374), brow presentation (p. 375), compound presentation (p. 396), hydrocephalus (p. 400), anencephalus (p. 403), in delivering the second twin (p. 407), double monstrosities (p. 408), in contracted pelves with a conjugate between 2¾ and 3½ inches—from 7 to 9 centimetres—(p. 463), asymmetric pelves (p. 474), uterine fibroids (p. 431), and rarely after craniotomy.

Third. Podalic version may be indicated by *dangers* threatening the mother or fœtus and demanding a prompt termination of labor. Such circumstances are, for the mother, hemorrhage, syncope, dyspnœa, rupture of the uterus, eclampsia, strangulated hernia, impending death; for the child, hemorrhage, asphyxia, prolapse of the pulsating umbilical cord in face presentation in every case, and prolapse of the cord with vertex presentation if it cannot be replaced and retained.

Fourth. *Inertia uteri* rarely calls for podalic version, except in regard to the delivery of the second twin.

Extraction.—In the case of dangers to mother or fœtus and of inertia uteri, the podalic version should, of course, be followed immediately by the extraction of the child (p. 382). Under the other indications — transverse presentation and head presentation — the operation proper of podalic version is accomplished when the breech is at the brim of the pelvis. In this connection it must be noticed that it is not enough that a fóot is brought outside the vulva. In order to be sure to have the breech engaged, the knee must be at the rima pudendi.

When the breech is engaged the expulsion might be left to nature, but, as a rule, the obstetrician prefers to let extraction follow immediately and have done with the case, so much more so as the condition for which the version is undertaken, especially contraction of the pelvis, exposes the fœtus to danger and calls for his interference also during its expulsion. Only in placenta prævia, when the fœtus is used as a tampon, the immediate extraction is contraindicated.

Conditions.—First. The chief condition requisite for the performance of podalic version is that the pelvic cavity must be roomy enough to allow the passage of the hand of the accoucheur, holding one or both feet of the fœtus.

Second. The presenting part must not be so impacted in the pelvis that it cannot be lifted up and make room for the entering hand and arm.

Third. The os must be dilated or dilatable. If there is time, it is best to await full dilatation; but if the indication for the operation is of such a nature that immediate delivery is urgently called for, the obstetrician will perform it as soon as he can, even if the os is imperfectly dilated.

Fourth. The lower uterine segment must not have become so distended that by the additional tension caused by the introduction of the hand it must rupture. When the contraction ring is drawn so high up over the fœtus, turning is contraindicated.

It is a great advantage if we can turn before the membranes are ruptured, or at least while some of the liquor amnii is still retained in the uterus. But even if all the waters have drained off and the uterus has contracted on the fœtus, podalic version by the internal manual method may be tried, and will sometimes succeed while the external method and the internal digital method are powerless and cephalic and pelvic version are out of the question.

Modus Operandi.—The operation can often be performed in the patient's bed.

Posture.—She may be placed on her back across the bed as for forceps delivery (p. 590), or she may be placed on her side. The lateral position offers in most cases real advantages in turning. In easy cases one position is as good as the other, but in difficult cases, especially when the abdomen of the fœtus is turned forward against the abdominal wall of the mother, it is easier to reach the feet when the patient lies on her side. The position of the accoucheur's arm is much more natural with the patient on her side, when it enters in a horizontal direction or even from above downward, than when he is obliged to force it from below upward.

In cross presentations the patient should be placed on that side where the breech is.

Time.—If the membranes are entire there is, as a rule, no hurry, and the accoucheur can and should wait till the os is fully dilated, or he should dilate it by the means described above (p. 583 *et seq.*). But if the waters have broken he should operate promptly, in order to save as much liquor amnii as possible and prevent the uterus from closing in on the fœtus.

Anæsthesia.—The patient should be anæsthetized, not only in order to save her from pain, but also because full anæsthesia to the surgical degree considerably facilitates the execution of the operation.

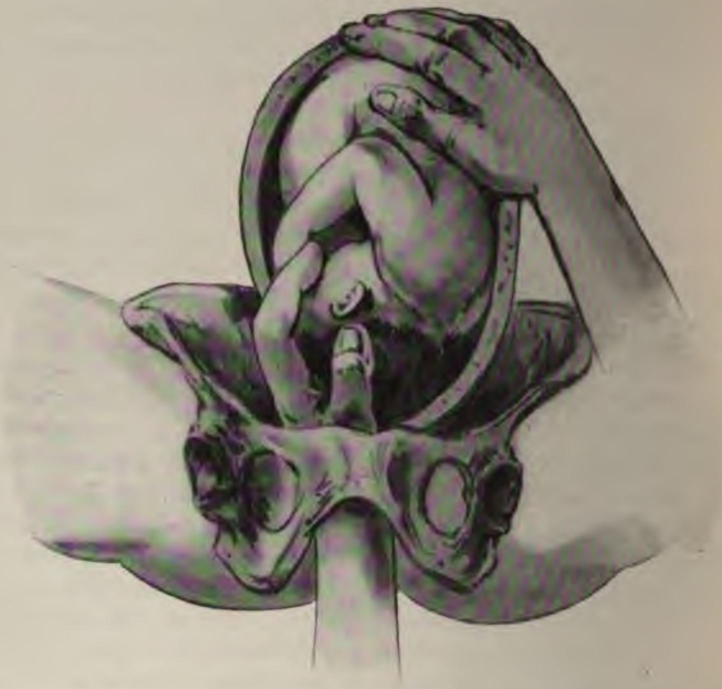
Two *fillets* should be kept within reach. They should be about a yard long. Linen tape half an inch wide or narrow lamp-wick may be used when properly disinfected. Means for reviving the child in case of asphyxia should also be prepared (p. 559).

The *choice of the hand* is not very important, the best proof of which is that the rules given by different authors differ materially from one another. The choice depends also on the position—dorsal or lateral—in which we place the patient. The guiding principle should be to introduce that hand which most easily will reach with its volar surface the abdomen of the child. In head presentations we choose the left hand when the occiput is turned to the left (Fig. 453), and the right when it is turned to the right. In transverse presentation the writer would recommend to place the woman on the side where the breech is and introduce the homonymous hand if the back of the fœtus turns forward, which it commonly does, and the heteronymous hand in dorsoposterior positions. If the breech is in the left side the woman should lie on the left side, and if the fœtus is in dorso-anterior position the accoucheur introduces the left hand, but if the back of the fœtus is turned backward—which is rarer—the right hand is preferable. If the breech lies to the right the woman is placed on her right side, and the accoucheur uses the right hand if the back is turned forward, and the left hand if the back is turned backward.

In difficult turnings the hand often becomes so numb from pressure of the contracting uterus that it can not be used any longer. To some extent this may be avoided by holding the hand flat against the fœtus during a labor-pain; but when it happens, the hand must be withdrawn and replaced by the other; and sometimes this change has to be repeated several times.

It appears from the foregoing that the accoucheur should use his utmost care in making out the presentation and position of the fœtus, in order to obtain the greatest advantage in turning it. But if it is not possible for him to arrive at a definite conclusion in this respect, he had better introduce the left hand, because in head presentations the back is most commonly turned to the left. In this and in other cases, if the hand chosen does not adapt itself well to the situation found in the uterus, it should be withdrawn and replaced by the other.

FIG. 453.



Podalic version by the internal manual method, head presentation.

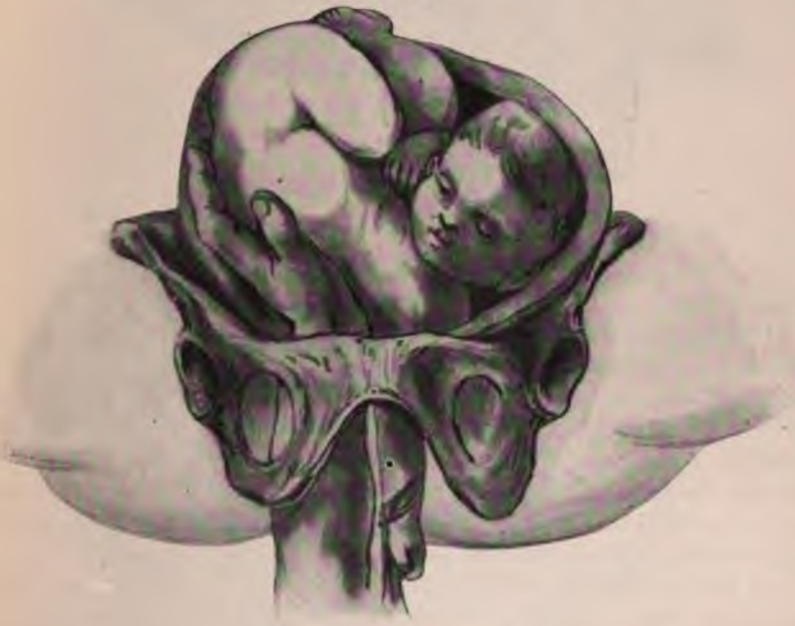
If, in neglected shoulder presentation, the arm prolapses, a fillet should be placed at the wrist, so as to be able to retain it, and the homonymous hand should be introduced (Fig. 454). How it is found out which is the homonymous hand has been explained above (p. 393).

When the patient is in the dorsal posture, the accoucheur stands in front of her, between her separated legs. If she lies on the side, he stands behind her.

The hand is lubricated and introduced as described above (p. 619). The other hand is placed on the abdomen of the patient, and co-operates with that in the uterus, sometimes pushing, sometimes pulling on the part to be dislodged. The hand should be introduced during the interval between contractions.

If the membranes have ruptured, the accoucheur enters the interior of the ovum. If they are intact, he ruptures them then and there, pushing the arm rapidly in so as to prevent the waters from escaping. If the position of the feet is known, it is best to go directly for them. Otherwise the hand follows the side of the fœtus until it reaches the breech. Then it descends along the thigh and the leg to the foot.

FIG. 454.



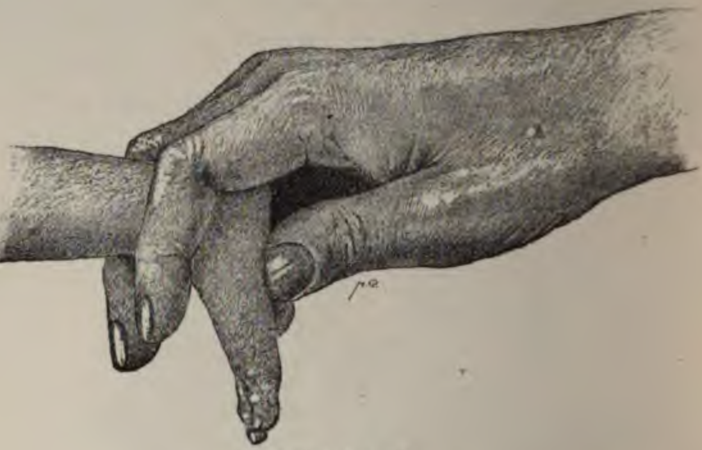
Podalic version with prolapsed arm.

As this is slippery, a good hold is secured by seizing it between the index and the middle finger above the ankle and pressing the thumb against the sole (Fig. 455).

Several great obstetricians prefer to seize the knee, for which there are excellent reasons. As a rule it is nearer. Secondly, you need only one finger for hooking it behind the knee. Thirdly, the knee being nearer the part you want to dislodge, you can exert greater force, and the fœtus can stand more at the knee than at the foot without injury.

It is better only to pull one lower extremity down, as the other, extended along the abdominal surface, serves to protect the umbilical cord. If both are seized at the same time, which may be done when the child is dead, one is held between the thumb and the index-finger and the other between the index and the middle finger.

FIG. 455.



Way of seizing foot.

Opinions also differ much as to which knee or foot should be seized, the upper or the lower. Since it is easier to seize the lower foot, and since in the vast majority of cases turning may be effected by pulling on it, it is the simplest to take the first foot you can get hold of. If, however, this foot in cross presentation is that of the same side as the presenting shoulder, the fœtus is apt to become jammed in the pelvis (Fig. 456), while if you seize the opposite knee or foot the evolution is easily effected (Fig. 457).

If the revolution does not succeed by pulling on the foot first seized, the other must be sought and brought down. For safety's sake a fillet is placed over the first foot. The accoucheur places the volar surface of the corresponding hand against its inside and follows it up to the breech. The hand is next carried over on the other thigh and follows it until the knee is reached. Putting the thumb in the popliteal fossa and a couple of fingers along the tibia, he bends it, seizes the foot and pulls it down.

In an asymmetric pelvis great advantage may be derived by pulling on that foot which will cause the broader occiput to come through the wider part of the pelvis (p. 474).

Difficulties.—If the waters have drained off, turning may prove very difficult or even impossible. The uterus may be in a constant

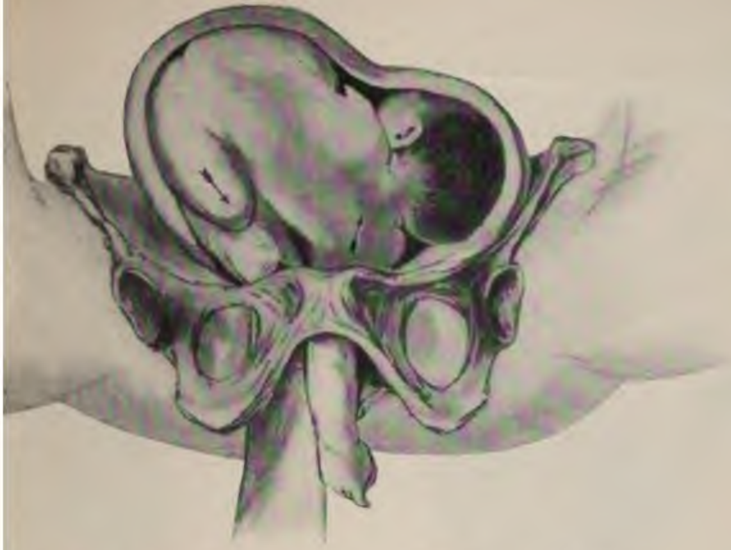


FIG. 456.—Seizing the leg of the same side as the presenting shoulder.

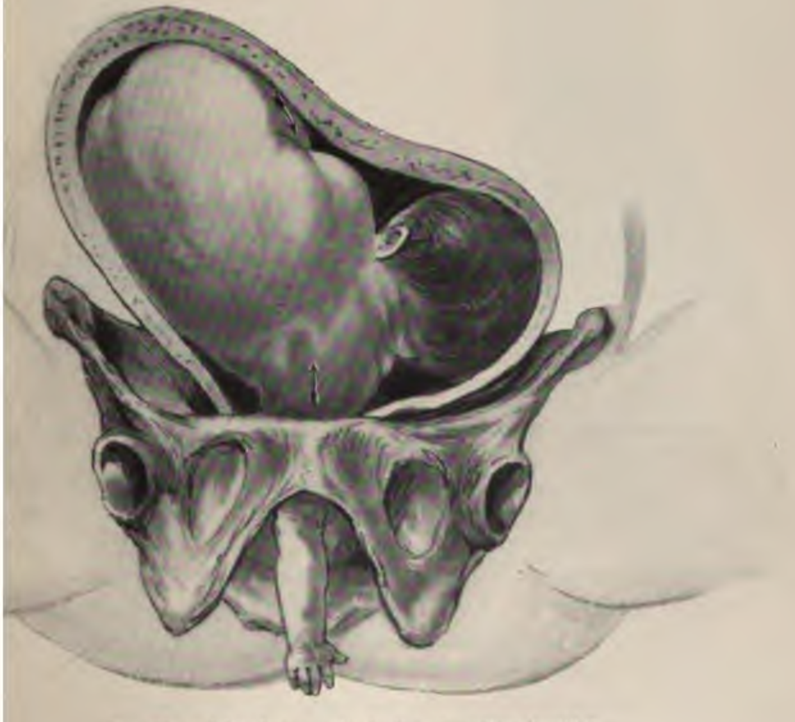
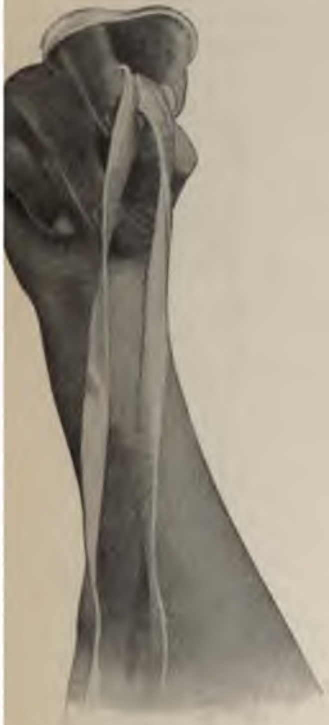


FIG. 457.—Seizing leg opposite to the presenting shoulder.

ndition of contraction without relaxation—so-called *tetanus uteri.* re chloroform is the remedy, but it must be administered to deep rcosis. If no chloroform were obtainable, large doses of mor- ine and a warm bath might be useful.

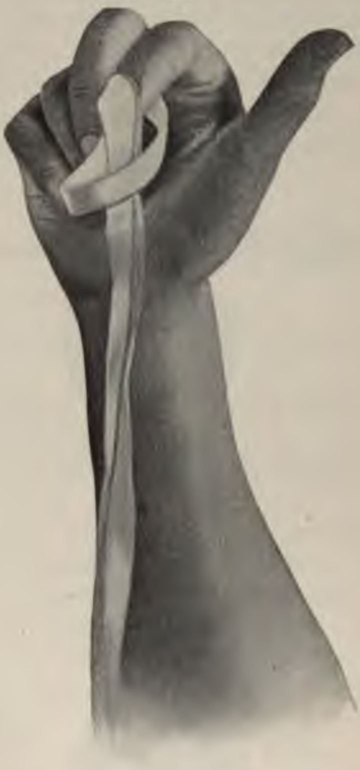
The uterus may be in close contact with the fœtus and still t be tetanically contracted. This condition of mere adaptation the uterus need not present any particular hinderance to the roduction of the hand.

FIG. 458.



king a noose with one hand, first step.

FIG. 459.



Making a noose with one hand, second step.

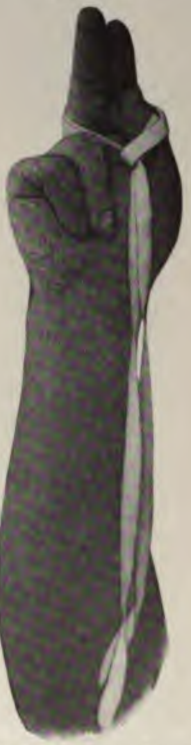
Immediately after the escape of the liquor amnii the uterus y be so strongly contracted that the hand cannot enter. Then is better to wait a little until it relaxes, and give chloroform.

If the feet or knees cannot be reached, it is sometimes possible l advantageous to turn the child around its longitudinal axis.

It may be quite difficult to seize a foot or to pull it down. Here the et is of great value. The practitioner should practise the formation a noose by means of one hand, so as to be able to form one while e of his hands is in the uterus. The ribbon is laid over the back of the index and middle finger. Next the wrist is bent and the ends seized between these fingers and drawn through the loop (Figs. 458, 459). The noose thus formed is carried around the thumb, index, and middle finger (Fig. 460), and with them pushed over the foot and tightened above the ankles by pulling on the free ends (Fig. 301, p. 387). If the noose cannot be applied in this way, it may be pushed up from the fingers to the foot with a long artery-forceps or clamp.

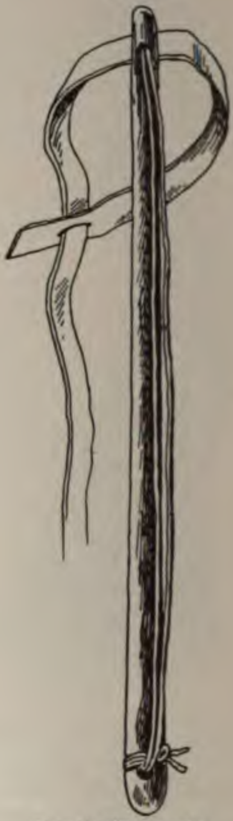
If there is not room enough for the three fingers, it may, perhap still be possible to snare the foot by means of Braun's *fillet-car*

FIG. 460.



Carrying noose on fingers.

FIG. 461.



Braun's fillet-carrier.

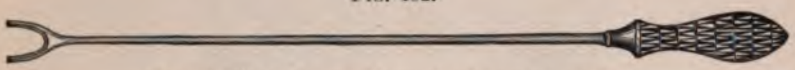
(Fig. 461). It consists of a rod about a foot long, with a hole each end, and a strong thread, which is carried through the ho forming a loop at the upper end, through which the tape is pas The rod is guided with the hand up to the foot, and when the no has been brought around the ankle, the ligature is withdrawn the rod removed.

This may also be accomplished by means of a sound-like rod ending in a little curved crutch (Fig. 462), an instrument used in snaring intra-uterine polypi.

Robert Barnes praises a wire écraseur as a means of snaring a foot. In order not to injure the leg the wire might be covered with a piece of rubber tubing.

Considerable difficulty may also be experienced in trying to effect the revolution of the fœtus. In simpler cases this is obviated by pulling on the leg in the direction of the head. Secondly, pressure may be exercised on the head from without, so as to lift it while the breech is being pulled down. Thirdly, the head may be pushed away with the thumb of the internal hand. If this does not suffice, recourse may be had to Justine Siegemundin's *double manœuvre.* A fillet is passed around the leg, which is pulled down with one hand, while the other, introduced into the interior of the uterus, presses the head up (Fig. 463).

FIG. 462.



Routh's fillet-carrier, used in snaring intra-uterine polypi.

The resistance met with during turning may be due to *crossing of the legs.* Then the other foot must be brought down.

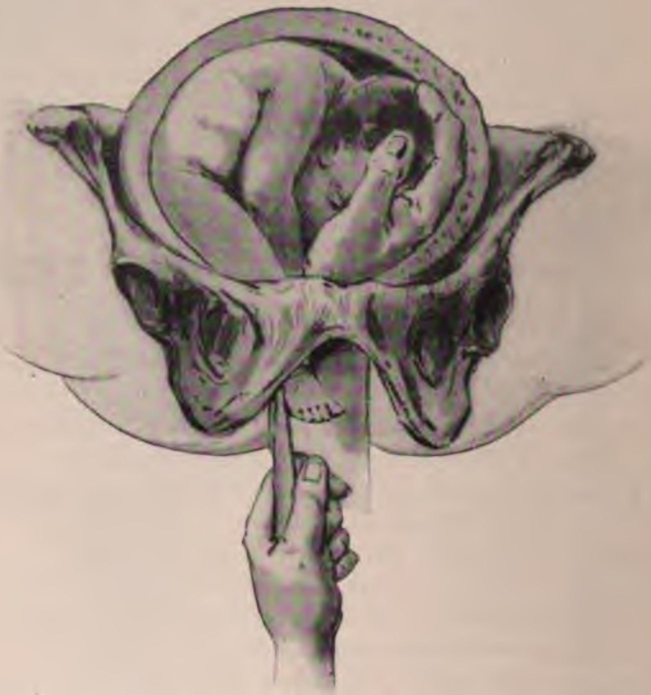
The prolapsed arm should neither be replaced nor amputated, but surrounded by a fillet, as described above.

In regard to *extraction*, the reader is referred to what has been said about it in treating of pelvic presentation (pp. 382–387); but while in ordinary cases of breech presentation we warned against pulling on the legs and recommended to leave the expulsion to nature, after version, as a rule, extraction has to follow promptly, and then we pull directly with the fingers or by means of a fillet on the foot which we have brought out. Traction should always be applied as near outside the vulva as possible in order not to injure the fœtus. As this is slippery, we surround it with a clean towel. In pulling we favor rotation in such a direction that the occiput turns forward. When the second leg has been delivered, we pull on both thighs, then on the pelvis, and finally on the abdomen and back until the lower angle of the scapula is reached, when the arms are delivered and after them the head, as described at the place referred to.

Prognosis.—In simple cases a fœtus may be turned and extracted with ease and expedition without harm to itself or its mother. This holds good particularly when there is no mechanical disproportion between pelvis and fœtus, and the membranes are unruptured or recently ruptured with the preservation of most of the liquor amnii.

In other cases version may be fraught with dangers for mother and fœtus. For the mother we must consider possible infection, tears of the cervix, vagina, and perineum, and rupture of the uterus. But with proper precautions the prognosis for her is, upon the whole, favorable. For the fœtus it is much more serious. Any circumstance that prevents a delivery within a few minutes may cause its

Fig. 463.



Double manœuvre for dislodging head.

death (p. 380), especially through compression of the umbilical cord or detachment of the placenta.

Comparison between Forceps Delivery and Version.—Version and forceps delivery are the two common conservative operations, which in modern times have considerably lessened the recourse to craniotomy. Version has the advantage that it does not require any instruments, and may therefore be available under circumstances where none are at hand. It can be performed when the conditions we have demanded for the application of the forceps—a fully dilated os and engagement of the head—are not present.

When the head is freely movable over the brim of the pelvis, version is the operation to perform. When the head is engaged, forceps should be used. In general, the forceps is safer for the child.

In contracted pelves with a true conjugate of 3¼ inches (8 centimetres), some obstetricians prefer early version and extraction to expectancy and the application of the forceps (see p. 465).

CHAPTER VIII.

SYMPHYSEOTOMY.

After having considered the more common conservative obstetric operations, forceps delivery and version, it remains to describe the rarer operations belonging to the same category, symphyseotomy and Cæsarean section, which differ from the others by being distinctly surgical operations, in which tissues are cut.

Symphyseotomy[1] is an operation in which the symphysis pubis is severed.

It is a comparatively young procedure, having been proposed by the French medical student Jean René Sigault to the Academy of Medicine of Paris in 1768, and performed for the first time by the same physician in 1777. At that time Cæsarean section was almost sure death, and the new operation, being supposed to be destined to supplant it, was hailed with enthusiasm in France, although some of the leading obstetricians of the day opposed it from the beginning. It found favor in Italy, but was rejected in England and Germany, a grouping in which there doubtless was a religious element at work, the two former being preponderatingly Roman Catholic countries, while in the two latter Protestantism prevails. The Church of Rome has from olden times hurled its anathema against the destruction of fetal life under any circumstances, and it saw in the new operation a substitute for craniotomy.

On account of the bad results, its triumph was, however, of short duration even in the land of its birth. Italy alone held out and preserved this useful operation for coming generations. Morisani of Naples brought the subject before the International Medical Congress convened at London in 1881, but it hardly received any attention until 1891, when Spinelli, a pupil of Morisani, during a visit to Paris, demonstrated the operation to Pinard, and the Parisian obstetrician Charpentier simultaneously heard Morisani lecture on it at Naples, and presented a report on it to the Academy of Medicine of Paris. After having tried it in practice, Pinard became an enthusiastic champion for the operation in 1892 and has remained so ever since. Obstetricians in other countries followed his example, and obstetrical societies declared themselves in favor of its adoption among the legitimate resources of the obstetrician.

---

[1] Garrigues, "Symphyseotomy, with the Report of a Successful Case," Amer. Jour. Med. Sci., March–April, 1893; "Symphyseotomy," Amer. Jour. Obst., 1893, vol. xxviii., No. 5; "On Symphyseotomy, with the Report of a New Case," Medical Record, Nov. 10, 1894, vol. xlvi., No. 19.

Personally I performed the first symphyseotomy in New York on December 30th, of the same year.

Space Gained.—The object of the operation is to obtain a temporary enlargement of the pelvis, which goal both experiments on the cadaver and clinical experience have shown can be reached. In order to be conclusive, these post-mortem experiments must, however, be made on bodies of women who died at or near term or a short time after delivery, for during pregnancy the ligaments that form the hinges between the pelvic bones become much more mobile than before or later. If the knees and hip-joints are kept bent, as they ought to be, and the symphysis is cut, the ends of the bones separate spontaneously from 3 to 4 centimetres (1¼ to 1½ inches). This is due to the elasticity of the sacro-iliac articulations, the contraction of the muscles surrounding the pelvis, especially the gluteus maximus muscle, and the weight of the pelvis in front of the sacro-iliac joint and that of the lower extremity. By pulling on the iliac bones or pressing the knees outward, this distance may easily be increased to 7 centimetres (2¾ inches). And the same distance has been measured during extraction with forceps, without any injury to the sacro-iliac joints. It is generally stated that if this separation is carried to 8, 9, or 10 centimetres (3⅛ to 4 inches), one or both joints crack and open; but that there are exceptions to this rule appears from my second symphyseotomy, in which the separation after the extraction of the large child was 5 inches (13 centimetres), without injury to the articulations.

When the pubic bones separate, the anteroposterior diameter of the pelvis ceases to exist. The gap in front allows the eminence of the anterior parietal bone to enter, which has the same effect as if the diameter became 6–8 millimetres (¼–⅜ inch) longer. Besides, the distance from the centre of the promontory to the end of the pubic bones increases the more the greater the distance becomes between these bones. It has been found that this increase is about 2 millimetres for each centimetre distance between the pubic bones. The maximum safe distance of 7 centimetres (2¾ inches) gives consequently an elongation of 14 millimetres (*i.e.*, over ½ inch). Added to the 6 or 8 millimetres gained by the protrusion of the parietal eminence between the ends of the severed pubic bones, that makes the total gain, so far as the anteroposterior diameter of the pelvis is concerned, 20 or 22 millimetres (nearly an inch). But not this alone; the transverse and oblique diameter, and every line drawn from the middle of the promontory to a point on the anterior half of the iliopectineal line, increases from one-quarter to one-half of the distance between the ends of the bones, so that at the safe distance of 7 centimetres the increase will be from 17 to 35 millimetres (¾–1½ inches). A pelvis which before being cut only admitted a circle of 6 centimetres diameter, after the separation admits one of 8.4 centimetres; and one which before the operation only admitted one of 8 centimetres, after the operation admits one of 9.8 centimetres. Besides the gain in space obtained on the same level, the ends of the broken ring can be moved up and down perpendicularly, which may offer an additional help in the delivery of the child.

Prognosis.—In many cases more or less severe *hemorrhage* has occurred. Even deaths from this cause have been reported,[1] and several times hemorrhage could only be checked by circumventing the crura of the clitoris. Hemorrhage may be arterial or venous. As a rule, no large arteries are met with, but one operator in a fatal case met with one running in the direction of the descending ramus of the pubis, which was as large as the radial.[2] Behind and below the symphysis run large veins, which have been cut in many operations. Exceptionally, a secondary hemorrhage has arisen.[3] Numerous *injuries* to the mother have occurred. The vestibule and vagina have been torn. The bladder has been caught between the ends of the bones in bringing them together after the operation, or wounded by the sharp edges of the bones during the extraction of the fœtus. Repeatedly the operation has left a vesicovaginal fistula. A temporary incontinence due to pressure of the urethra is quite common, and several times this canal has been wounded during the operation or has subsequently given way to suppuration in the surroundings. In one case the whole upper wall was torn, and although the edges were united, the incontinence remained permanently.[4] Sometimes the injuries have healed spontaneously, and in most cases the wounds have been successfully united by suture. Not rarely one or both sacro-iliac articulations have been ruptured, and given rise to a permanently waddling gait, which, however, does not prevent the patient from walking miles and doing the hardest physical work. Post-partum hemorrhage is common, probably on account of the administration of chloroform and the rapid evacuation of the uterus. Fever is also quite frequent.

The fœtus suffers less injury. Still cases of fracture of the cranium have been reported. The prognosis for the fœtus is better with delivery by forceps than with version. If the fœtus is not much exposed to injury, it runs other risks; especially is it quite common that children delivered by symphyseotomy are born asphyxiated. This asphyxia may be attributed to the slowness of labor before the operation, premature rupture of the membranes, prolapse of the cord, or the manual or instrumental extraction of the child.

---

[1] The bibliographic references are found at the end of the chapter, p. 656.

As to the hemorrhage and injuries that have happened to the mother, they can probably be entirely avoided by a mode of operating which presently will be described.

On account of the many injuries followed by suppuration, convalescence has been protracted. Thus, in the clinic of Leipsic the average time has been thirteen weeks.[5]

Mortality has also been considerable. Rubinroth,[6] examining the world's literature for the three years, 1896, 1897, and 1898, found 136 cases with a maternal mortality of 11 per cent., and an infantile mortality of 14 per cent.[7] This large mortality, however, loses much of its significance by examining details. Thus, we find that Pinard had 12 per cent. maternal mortality, but he had the same mortality, due to sepsis, with craniotomy,[8] where there ought not to be any at all, which awakens the suspicion that asepsis and antisepsis were not properly attended to, or that some other avoidable error in the treatment prevailed. Zweifel reported 31 consecutive operations, Küstner 7, and Bar 23, without a death.[9]

Secondly, it must be remembered that a large number of symphyseotomies have been performed after the woman had been long in labor and treated by midwives or general practitioners, while nobody would be willing to perform Cæsarean section under similar conditions.

Other obstetric operations, such as the high forceps operation and version followed by extraction, have also a high maternal mortality.

If the operation is held within proper limits and properly performed, and especially if the strictest antisepsis and asepsis have been observed from the moment the patient was taken in labor, there is no danger for her life in the operation itself.

Indications and Limits.—Symphyseotomy having only been before the profession for a decade since its revival in 1892, views as yet differ much among leading obstetricians in regard to the field it should occupy among obstetric operations. Morisani speaks only of its use in the flat pelvis, and basing an argument on the average length of the biparietal diameter of the fetal head, 95 millimetres (3½ inches), which by compression may be reduced to 88 millimetres (3¼ inches), and the addition gained for the true conjugate by symphyseotomy, 20–22 millimetres (¾–⅞ inch), he concludes that the lowest limit of the operation is 67 millimetres (2⅝ inches) true conjugate, and the highest 88 millimetres (3½ inches). With a true conjugate of 67 millimetres (2⅝ inches) it is difficult; with one of 74 millimetres (3 inches) and upward it becomes more and more easy.

But such mathematical calculations are of little value in obstetrics, where constantly we have to deal with unknown or little-known factors. The true conjugate cannot be measured, but is found by a calculation into which there enters much uncertainty, and the size of the biparietal diameter of the fœtus hidden in the depth of its mother's abdomen is still less reducible to measurements expressed in the terms of an accurate standard.

Practical observation has taught that delivery by normal birth, forceps or version is possible down to a true conjugate of 2¾ inches (7 centimetres) if the child is small and the head easily moulded; but both forceps and version give, in general, disastrous results with a conjugate below 3¼ inches (8 centimetres). There is a great mortality, both maternal and fetal, and, if the child survives, there is danger of its becoming idiotic or epileptic. *The safe and proper field for symphyseotomy with flat pelvis lies, therefore, in cases where the conjugate is between 2¾ and 3½ inches* (7–9 *centimetres*).

Pinard[10] has introduced the following rules in his clinic:

1. No induction of premature labor to be done if symphyseotomy at term promises to allow the delivery of a living child.

2. No craniotomy to be performed on a living fœtus.

3. In any case of bony obstruction to the passage of the head, which is not overcome by uterine contraction, symphyseotomy, pubiotomy, ischiopubiotomy, or coccygectomy shall be performed, if the head is properly placed, and if sufficient room for its passage will be gained by the operation.

4. In cases of absolute narrowness of the pelvis, utero-ovarian amputation is to be performed.

He has abandoned version and rarely uses the forceps in the cases covered by the third rule.

Diametrically opposed to Pinard, Leopold[11] has little use for symphyseotomy, and prefers craniotomy and Cæsarean section.

As a matter of fact, symphyseotomy has been performed or recommended for (1) flat pelvis; (2) pelvis partly obstructed by a tumor; (3) narrowness of the transverse diameter of the outlet; (4) kyphotic pelvis (p. 480); (5) occipitoposterior position of the presenting vertex; (6) lateral obliquity of head (ear presentation, p. 366); (7) face presentation with persistent mentoposterior position (p. 371); (8) brow presentation (p. 376); (9) large fœtus.

In the writer's opinion, it is very difficult at the present time to give general rules when symphyseotomy is indicated, but he is inclined to think that it ought to be performed much oftener than it is in America. Many things have to be taken into consideration. In hospital practice I think Pinard's rules might be followed, if for no other reason in order to perform the operation often, become familiar with it, and improve its technique. The obstetrician in charge of such an important institution as a lying-in hospital owes greater allegiance to science than to anything else. It behooves him to collect material, observe it, and describe it so well that his experience may become a guide for the profession at large. He has certainly the right to refuse to kill a fœtus, and even to expose it to the great risks of induced premature labor, when he can offer a means by which both mother and fœtus may be saved. In private practice the case is different. The accoucheur is here engaged to see a woman safely through her confinement. Those who have secured his services have a certain right within the bounds of law and morality to see their wishes accomplished. Most often the accoucheur is urged to save the mother even at the expense of the fœtus; but maternal heroism or inheritance considerations sometimes incline the balance in favor of the latter. Considerations of necessity and expediency also impose themselves. The first question in this respect will be whether the physician is able to perform the operation, or other more skilful help can be procured, and if the necessary assistance can be obtained. For a symphyseotomy at least two skilled persons—an obstetrician and a surgeon—are required. After symphyseotomy there is a protracted convalescence, and the question of the financial resources of the patient must often have some weight.

In consultation practice the case is often seen so late that the patient is exhausted and the child weakened; and quite commonly the antiseptic measures taken have been so imperfect that there is strong suspicion of the patient having been infected.

Under all circumstances it ought to be borne in mind that symphyseotomy is a serious operation, containing elements of danger for the life or the health of both mother and fœtus. In the beginning an expectant treatment is indicated, especially in primiparæ, whose history does not throw any light on the possibility of bringing forth a child. Every obstetrician with any experience will have seen cases in which, on account of a pelvis measuring only three inches at the true conjugate, he anticipated a very difficult delivery, and prepared himself to perform some operation, and in which a living child, sometimes even of goodly size, was born by nature's sole efforts.

Indications based on pelvic measurements are of much less value than one would think. At least in the writer's experience too large children give rise to more obstetric difficulties than the narrowness of the pelvis. The practitioner should, however, make himself acquainted with pelvimetry, since by that he often may obtain valuable information which may put him on his guard against impending trouble. But he should not be satisfied with finding a normal pelvis; he should also use every means of forming an opinion of the size of the child (pp. 187, 188). This is a point that is almost entirely overlooked. Commonly the practitioner has no idea either of the size of the pelvis or of the fœtus, and it is only lack of progress in spite of good labor-pains, insufficient dilatation of the os, and the premature rupture of the membranes that make him surmise that something is wrong.

One thing which the youngest, the humblest, the least experienced practitioner may do, and ought to do, is to avoid increasing the danger a hundredfold by infecting his patient in his examinations.

But even if the patient has been long in labor, even if attempts at forceps delivery have been made, even if there is strong suspicion of puerperal infection, symphyseotomy may be practised to advantage, which in my opinion is so great a point in its favor that I fervently hope it will not be allowed again to fall into desuetude, but, on the contrary, will be resorted to much more frequently than it is now. Both my cases were met in private consultation practice and belonged to the latter category, and there was no other means of delivering the women than by performing symphyseotomy or by killing their splendid fœtuses, and by inactivity, perhaps, causing the death of the mothers too. I think with great regret of cases in which symphyseotomy was not performed, and in which the fœtus was destroyed by craniotomy, and sometimes the mother died subsequently of sepsis. If doctors only would practise antiseptic midwifery and seek help in time, many a life might be spared that now is extinguished with the perforator or falls a prey to the no less deadly microbes.

Examination of the Pelvis.—It appears from the above that the first condition for a rational decision as to the propriety of performing symphyseotomy is the exact mensuration of the pelvis with pelvimeter and the hand, in which respect the reader is referred to what has been said above (pp. 115–117).

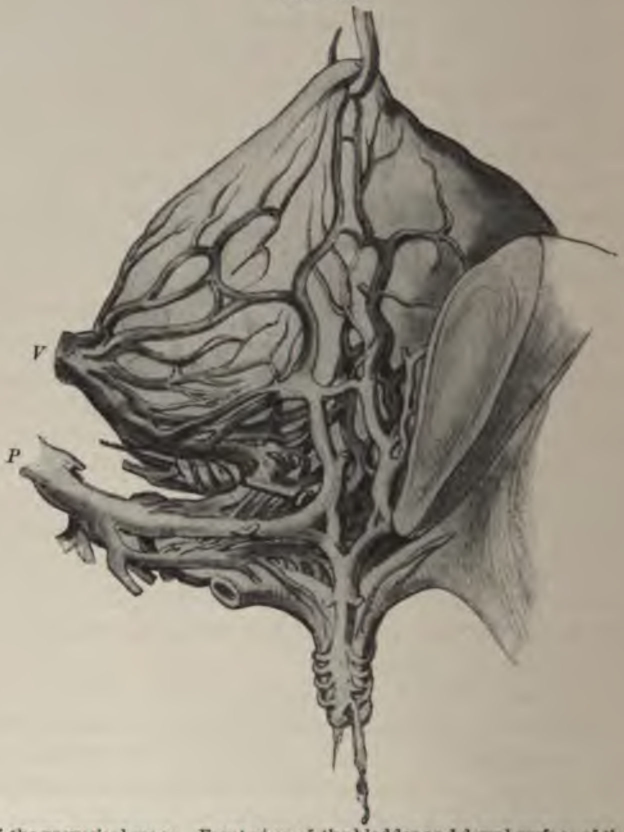
After having measured the pelvis, the mobility of the sacro-iliac joints must be tried by alternately extending and flexing the extremities and abducting the bent knees. The gait of the patient and her previous history may also give valuable information on this point.

Examination of the Fœtus.—Of no less importance is the examination of the fœtus according to the rules laid down above (pp. 108, 111, 187, 188, 398), which will give information about its life, size, presentation, and position.

Examination of the Soft Portion of the Parturient Canal.—The accoucheur should finish his examination by careful observation of the condition of the cervix, the os, the membranes, the vagina, and the vulva, which, if it does not determine his choice of operation, may guide him in regard to the time and preparations for it. Symphyseotomy should not be performed before the os is fully dilated; but, if it is not, dilatation may be obtained artificially as described above (p. 583), especially with Barnes's and Champetier de Ribes's bags. In primiparæ there mostly is considerable resistance of the vagina and vulva, which also can be overcome with Champetier's bag or Braun's colpeurynter.

Anatomy.—As for any other operation, the accoucheur should make himself fully familiar with the normal anatomical construction

FIG. 464.

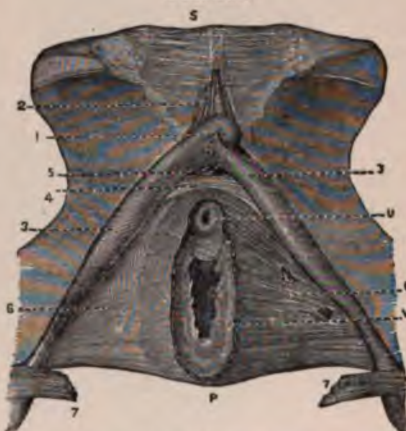


Veins of the prevesical space. Front view of the bladder and dorsal surface of the clitoris, the right crus of which, as well as the right side of the pelvis, has been cut away. *P*, internal pudic vein, receiving blood from the dorsal and cavernous veins of the clitoris, the urethral and anterior vesical veins, as well as from below from the bulb, the perineum, and the anus, which have been cut short; *V*, large vesical trunk, receiving the blood from the vesical plexus, which anastomoses with the tributaries of the internal pudic vein. A pin has been placed between the two chief veins.

of the parts he is going to invade. Fig. 118 (p. 86) shows well the thick layer of fat through which the knife has to go in an incision above the symphysis. Under this it severs the superficial fascia—generally called the deep layer of the superficial fascia—and then the aponeuroses of the obliquus externus, obliquus internus, and transversalis muscles united in the linea alba between the pyramidales muscles.

This brings us into the *prevesical space*, or *cavum Retzii*, situated in front of the transversalis fascia. The loose connective tissue found in it recedes easily, and we can introduce the finger behind the symphysis pubis, in front of the bladder. In the lower part of this space run large veins (Fig. 464), which come from the anterior surface of the bladder, from the urethra and the clitoris. These vesical veins form large plexuses communicating with those of the uterus, vagina, vulva, and rectum, and sending their blood to the internal iliac vein.

FIG. 465.



Front view of the perineal septum,—that is, the deep perineal fascia, or triangular ligament, showing the entire clitoris. (Savage.) 1, glans; 2, suspensory ligament; 3, crura of clitoris; 4, subpubic ligament; 5, dorsal vein of clitoris; 6, triangular ligament; 7, superficial transverse muscle; *s*, symphysis pubis; *u*, meatus urinarius; *v*, vagina; *P*, site of perineal body.

In front of the symphysis, about half-way down, is the body of the clitoris, fastened to it above by the *suspensory ligament*, terminating in front in the glans, and separating behind at the pubic arch into the two crura, small fibrous cylinders attached to the rami of the pubis and the ischium (Fig. 465).

The *symphysis* itself consists of an *interpubic disk* and ligaments (p. 137), the *superior*, *anterior*, *posterior*, and *inferior pubic ligaments*. The last is also called the *subpubic ligament*, and must be severed or loosened in order to obtain the necessary separation in symphyseotomy.

Immediately under the subpubic ligament runs in the median line the dorsal vein of the clitoris which ends in the pudic plexus surrounding the upper part of the urethra. On each side of the vein runs the dorsal artery of the clitoris. Close under and behind the subpubic ligament lies the strong *transverse ligament of the pelvis*, only separated from the subpubic by the vessels. Behind the transverse ligament is the *triangular ligament*, or *deep fascia of the perineum*, and above that the *rectovesical fascia of the pelvis* (Fig. 466).

These fasciæ are liable to be torn in symphyseotomy, and their relations should therefore be clearly understood.

The *deep perineal fascia* has two layers, a superficial and a deep layer, which extend from the transverse ligament of the pelvis in front to a line a little in front of the anus, behind the superficial transversus perinæi muscle, where the two layers coalesce and also join the superficial fascia of the perineum. At the sides these fasciæ are attached to the descending ramus of the pubis and the ascending ramus of the ischium.

The deep perineal fascia is perforated by the urethra and the vagina. The divided symphysis cannot be separated to any great extent without putting the fibres of this fascia on the stretch transversely, and if separation is continued beyond this point, the fascia must rupture. The tear will occur at the weakest point, which generally is along the line of perforation, and will involve the structures that pass through or are contiguous with this fascia,—to wit, the large veins, the clitoris, the urethra, and finally the vagina. It is the tearing of these structures that leads to most of the dangers and complications of the operation,—hemorrhage, sepsis, urinary fistula, incontinence of urine, etc.

FIG. 466.

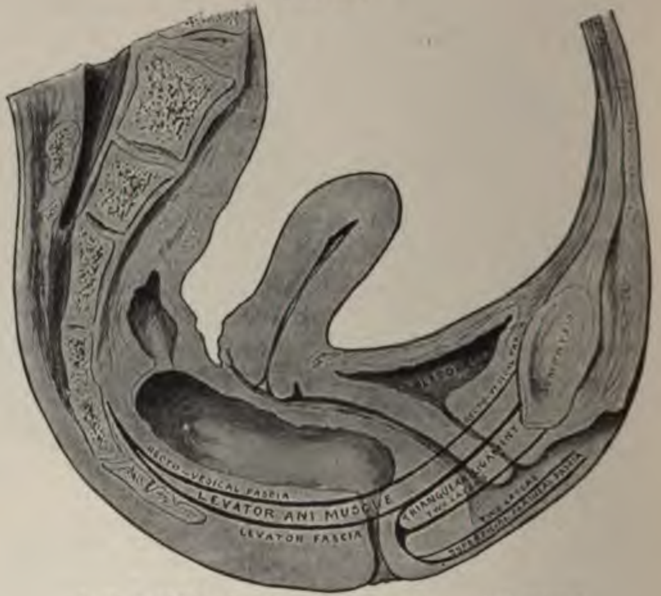


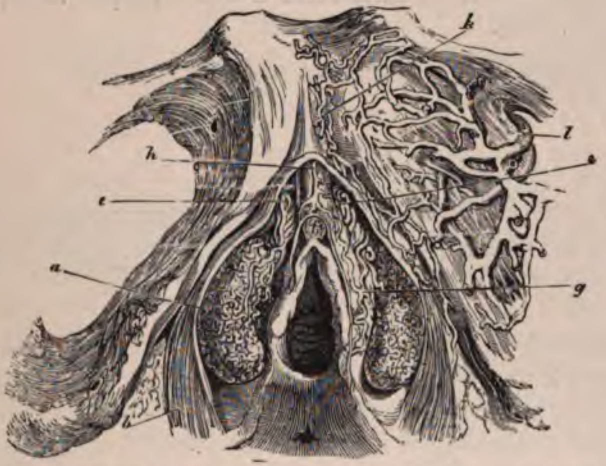
Diagram of the pelvic floor in mesial section. (Dickenson.)

In the vulva, under the mucous membrane and the superficial perineal fascia, outside the entrance to the vagina, and inside of the sphincter vaginæ muscle, lie the *vestibulo-vaginal bulbs* (Fig. 467), which are chiefly composed of veins with numerous communications with those of the neighboring parts. Near the anterior end of the bulb they go from one side to the other, both behind and in front of the meatus urinarius, forming the *pars intermedia*, and from here they communicate with the corpora cavernosa of the clitoris.

Modus Operandi.—Three assistants are indispensable, one attending to the anæsthesia and one on each side holding a leg and assisting at the field; but the safety of mother and child will be much better guarded by having one more, capable of replacing the operator either as accoucheur or surgeon. When delivery is accomplished, there often comes a critical moment, when the asphyxiated baby and the bleeding mother require equally skilful help, which cannot be rendered by the same person.

Table, anæsthesia, disinfection, evacuation of bladder, and perhaps rectum, as usual. The patient should be placed in the dorsal position, and the legs should be held bent in hip- and knee-joints, moderately separated and with the feet high. This is done by the assistants, who on command of the operator can raise or lower the knees, as the extraction of the child may require.

FIG. 467.



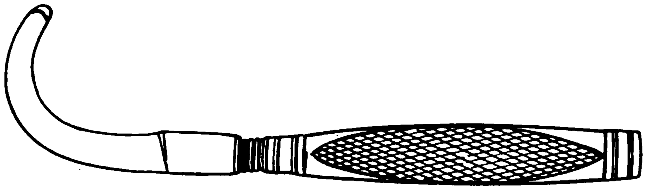
Front view of the external erectile organs. Two-thirds natural size. (Kobelt.) *a*, vestibulo-vaginal bulb; *b*, sphincter vaginæ muscle; *e e*, pars intermedia; *f*, glans clitoridis; *g*, connecting veins; *h*, dorsal vein of the clitoris; *k*, veins passing beneath the pubes; *l*, obturator vein.

Considerable interest attaches to the question about the place and the length of the first incision. It may be short, medium, or long. It may be above, below, or in front of the symphysis. The symphysis may be cut from behind, from the front, from above, or from below. The operation may be open or subcutaneous.

At the present date we must at least distinguish four separate methods, and for convenience I shall attach a man's name to each of them, although this man may have had predecessors who have done most of the work. Thus, Morisani's method, according to himself, dates from Galbiati at the end of the eighteenth century. Pinard's is the original Sigault operation; Ayers's is conceded partially to have been suggested by Dawbarn,[12] and a chief point in it, the introduction of a probe-pointed bistoury through a small opening made in the vestibule, was already recommended by Imbert, of Lyons, France, in 1833, and mentioned in my first paper, published in 1893. Harris has had a precursor in Porak,[13] who detached the triangular ligament from its median insertions.

1. *Morisani's Method.*—A longitudinal incision 3 centimetres (1¼ inches) long is made in the median line, ending 1 or 2 centimetres (½–¾ inch) above the symphysis. Small incisions are made transversely into the recti or pyramidales muscles to make room for the index-finger, which he inserts behind the symphysis to the lower end of the same. Next he introduces a sickle-shaped knife, *Galbiati's falcetta* (Fig. 468).

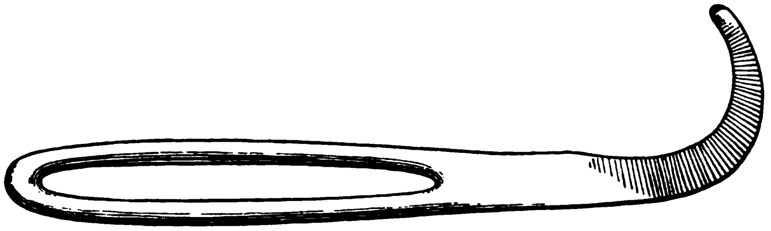
FIG. 468.



Galbiati's falcetta.

The figure is a photograph of a knife I got from Morisani in 1883. Later I had it modified according to the principles of aseptic surgery, and now it is made of one piece of steel without any furrows (Fig. 469). This sickle-shaped instrument is inserted alongside of the left index-finger, which is held against the posterior surface, down to the pubic arch. When the point has passed this, the handle is gradually pulled upward and forward, severing the symphysis, inclusive of the subpubic ligament, from below upward. The urethra is protected against injury by being held over to the patient's right side by means

FIG. 469.



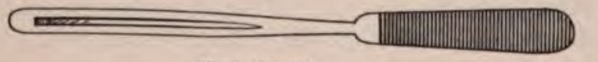
Galbiati's falcetta as modernized by the author.

of a male metal catheter, which at the same time serves to keep the bladder empty.

After having severed the symphysis, Morisani leaves the case to nature if the pains are good, but in about one case out of four traction with forceps has been found necessary. He is opposed to delivery by version.

2. *Pinard's Method.*—The incision, 8 or 10 centimetres (3–4 inches) long, begins at or above the upper end of the symphysis and ends at the root of the clitoris, or, if necessary, deviates to the left of it. The symphysis is severed from the front backward and from above downward. Some suitable blunt, flat, curved instrument is held behind the symphysis to protect the bladder,—for instance, Hay's director (Fig. 470) or Farabeuf's gorgeret.

FIG. 470.



Hay's director.

3. *Ayers's Method.*[14]—A small incision is made with a scalpel about ½ inch (1 centimetre) below the clitoris. The left index-finger is introduced into the vagina up to the upper end of the symphysis, and a curved probe-pointed bistoury is passed through the wound, close against the joint, to the top of the symphysis. The blade now lies under the vessels of the clitoris and in front of the symphysis, and need not cut any arteries. The tip of the bistoury and the tip of the finger in the vagina are brought together at the top of the joint. Then the bistoury is worked downward, the finger in the vagina accompanying it to within ¼ inch (½ centimetre) of the pubic arch. Then the bistoury is taken out, inverted, and made to cut upward, thus avoiding the pars intermedia of the bulbs of the vestibulum.

When the knife is removed, a pad of bichloride gauze is pressed against the wound and surface of the severed joint until the fœtus is delivered. This is intended to prevent hemorrhage and infection.

4. *Harris's Method.*[15]—An incision 4–5 centimetres (1½–2 inches) in length is made from a little above the symphysis to 1 centimetre (½ inch) above the clitoris. The suspensory ligament is detached, and the clitoris pulled down with a retractor in the lower angle of the wound. While cutting the symphysis, the legs are held firmly together, to prevent a sudden rupture in case of a labor-pain occurring. After separating the soft tissues well from the symphysis in front and behind, the symphysis is divided from above downward to the subpubic ligament, which is left intact. Next, this ligament and the triangular ligament are carefully detached from the bones forming the

pubic arch with a blunt-pointed bistoury, the finger protecting the neighboring soft part, and the knife being kept close to the bone, within a distance of 3 or 4 centimetres (1½ inches) on each side. As this detachment proceeds, the symphysis gradually opens, and it should be continued until the symphysis is fully separated, and no more tense fibres are felt stretched between the rami (Fig. 471).

And now, which of these methods shall we choose? In my first operation I followed Pinard, and had a good deal of trouble with hemorrhage and sepsis. In my second I acted strictly according to Morisani's prescriptions, except that I extracted with forceps immediately after cutting the symphysis, and I found it much more satisfactory. And when I have the opportunity of performing another operation, I think my choice will be Harris's method.

Those who have made the long incision have had much more trouble to contend with than those who, like Morisani and Ayers, use a subcutaneous method; but it is certainly more surgical to see what one is doing, and to arrest hemorrhage according to general surgical principles. Ayers's method exposes the large veins behind and at the lower end of the symphysis to being wounded. The incision in the vulva contains a serious element of danger as to infection. It is a general experience that of all tissues, bones and articulations are most apt to become infected, and it is impossible to render the vulva and the vagina aseptic.

Harris's method is based on solid anatomical ground: the wound remains two inches above the meatus urinarius; and hemorrhage and tears are avoided by separating the soft parts from the symphysis in front and behind, by not cutting the subpubic ligament, and by loosening it and the deep perineal fascia from their attachments.

If the head is impacted in the pelvis, it is not possible to introduce the finger into the prevesical cavity of Retzius or into the vagina, and it may then be necessary to cut the symphysis from the front, without any protection behind.

When the symphysis is severed, it should be cautiously separated to the full extent allowed by the sacro-iliac articulations, before attempting delivery, which is much safer than to use the fœtus itself as a dilator, which may cause the gap in the symphysis suddenly to spread, lacerating the urethra and vagina, and giving rise to severe hemorrhage.

I did not find any difficulty in my first case in using the ordinary curved, probe-pointed bistoury represented in Fig. 473.

Paul Zweifel,[16] in order to prevent stagnation of fluid and consequent absorption and infection, perforates the bottom of the prevesical space with a curved trocar, which is pushed out at the side of the urethra. It has a lumen of eight millimetres, through which he car-

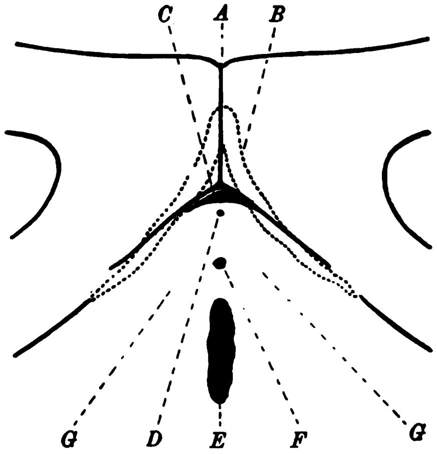


FIG. 471.—Symphyseotomy by Harris's method, front view. (Diagram.) *A*, incision through symphysis prolonged along the pubic arch (red); *B*, clitoris with its crura drawn up (dotted); *C*, subpubic ligament, or ligamentum arcuatum; *D*, vena dorsalis clitoridis; *E*, entrance to the vagina; *F*, urethra; *G*, triangular ligament, or deep perineal fascia.

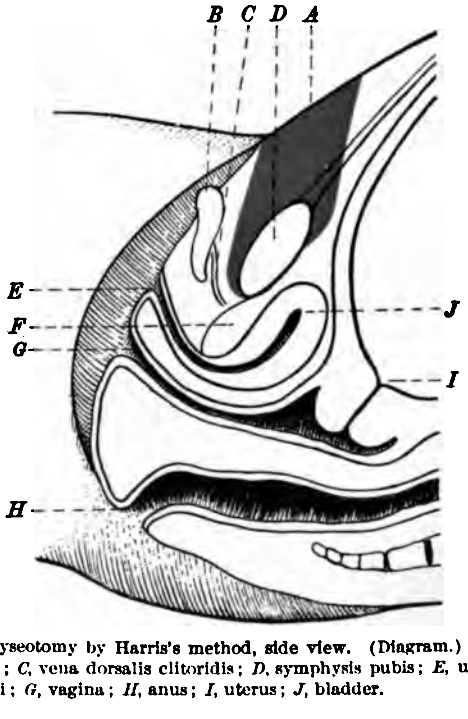
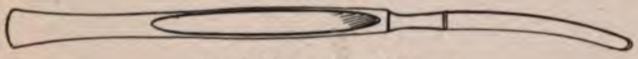


FIG. 472.—Symphyseotomy by Harris's method, side view. (Diagram.) *A*, incision to reach symphysis; *B*, clitoris; *C*, vena dorsalis clitoridis; *D*, symphysis pubis; *E*, urethra; *F*, prevesical space, or cavum Retzii; *G*, vagina; *H*, anus; *I*, uterus; *J*, bladder.

ries a rubber tube. The upper end of this comes to lie behind the stitched aponeurosis, and is fastened here with a silkworm gut, which is carried around a pledget of gauze and tied with a half hitch. On the fourth day this ligature is loosened, the gauze removed, and the drainage-tube shortened one centimetre (half an inch), which is repeated daily. If unexpectedly he encounters foul liquor amnii, the opening in the vestibulum might give rise to infection, and he therefore pushes the trocar through the labium majus so as to come out on its skin-covered surface. The cases thus treated with drainage had an absolutely feverless course.

If the obstetrician has the case in hand from the beginning, it is better, in the interest of both mother and fœtus, not to try delivery by forceps before proceeding to perform symphyseotomy. But in most cases such attempts have been made by others before the patient comes under his observation.

Fig. 473.



Curved, blunt-pointed bistoury.

When the symphysis has been separated, the wound should be packed with iodoform gauze or plain sterilized gauze, either dry or wrung out of creolin, which combines antiseptic and hæmostatic powers.

A point of great importance to settle is the question in what way, if any, labor shall be furthered beyond cutting the symphysis. Some leave the case to nature. As a rule, spontaneous delivery will soon follow the enlargement of the pelvis, but some have waited in vain for a whole hour. During this waiting, pressure on the trochanters must be kept up to avoid too great a distention. The membranes may be broken and the head pressed down into the pelvis from above and then seized with forceps or enucleated by pressure through the rectum. If there is any hemorrhage, the patient should be delivered at once. It is also an advantage to do so while she is anæsthetized. It seems that the forceps has given better results than version. Still, if the head is not engaged, and the child is in a precarious condition, it is better to turn and extract it.

Under rare circumstances even other operations may become necessary, such as embryotomy of the dead fœtus, or, if it is alive and cannot be delivered *per vias naturales*, Cæsarean section.

Exceptionally, the symphysis may be a synostosis instead of a synchondrosis, in which case it must be severed with a chain-saw or chisel and mallet. Some prefer then to go a little to one side of the median line, where the bone is thinner—*pubiotomy*.

Sometimes the ends of the bones form irregular protrusions, which prevent cutting the cartilage with one stroke. Perhaps it may be possible to follow the sinuosities of the bones with a small knife. Sometimes the protuberances have yielded to strong traction on the Galbiati knife, and in other cases recourse had to be taken to the saw.

If the placenta does not follow the child within a quarter of an hour, it is better to detach it artificially.

After the birth of the child and the removal of the placenta, the bones should be brought together by pressing on the trochanters. The fibrous tissue in front of the symphysis may be united by catgut or silk sutures, but these sutures have sometimes given rise to suppuration and secondary injury to the urethra, and the author does not deem any buried sutures necessary. All that is needed is to carry the deep sutures through the skin, the adipose and fibrous tissue down to the bone, and comprise from ¼ to ½ inch (½–1 centimetre) of the fibrous tissue on either side. When all the sutures are in place, the trochanters are pressed together, particular care being taken that the bladder and the vagina do not get in between the ends of the bones; and all sutures are drawn tight and closed from above downward. One or more superficial sutures may be needed for a perfect adaptation of the edges of the cutaneous wound. For these sutures silk answers every purpose. Silkworm-gut is rather short, and silver wire takes more time to apply and causes more pain in being removed.

In order to prevent the bladder from being caught between the ends of the pubic bones, Dawbarn advises to fill it, whereby it becomes globular and recedes from the gap in the symphysis.

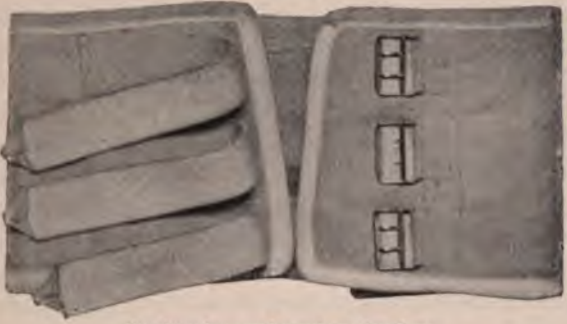
The sutures should be removed after eight or ten days.

Besides the sutures in front of the severed symphysis, the ends of the bones should be approximated by pressure exercised on the trochanters. In my cases I surrounded the pelvis with three straps of rubber adhesive plaster, two inches wide, which were tightened around the trochanters, each covering the preceding one in half its width, and crossed on the abdomen, just above the wound, while the legs were kept stretched out. These straps remained in place for nineteen days in the first case and were renewed on the thirteenth day in the second because they had become loose. This treatment gave entire satisfaction. The straps keep the ends of the bones in contact, they are water-proof, and allow one to lift the patient without causing any pain, by simply taking hold of the hips, while another person places the bed-pan under the patient.

Others have placed the patient on a cot with a hole cut out to allow discharges from the bladder or bowels to reach a vessel placed underneath; or lifted the patient in a wide canvas sling fastened to a hook in the ceiling; or constructed a special bed filling the double indication of keeping up pressure on the trochanters and lifting the patient; or compressed the trochanters with a metal girdle with hollow tampons, which are screwed against the trochanters. All this is ingenious, but in the writer's opinion superfluous and more or less expensive.

After removal of the plaster straps I used for a short time a broad bandage (Fig. 474) of gray coutil, with three straps and buckles. It measures 90 centimetres (35½ inches) at the top, 93 centimetres (36½ inches) at the bottom, and is 14 centimetres (5½ inches) high. This is removed when the patient uses the bed-pan.

FIG. 474.



Garrigues's symphyseotomy-bandage.

The wound should be dressed according to ordinary rules of surgery. The vulva should be covered with my pad (p. 201, Fig. 228).

Although injuries occurring during the operation occasionally may heal spontaneously, it is much better to repair them immediately with catgut sutures. If the bladder is torn, the tear should be closed with continuous catgut tier-sutures, one applied to the mucous membrane, the other to the muscular coat and the peritoneum.

If there are no complications, the patient may safely leave the bed at the end of three weeks, and be dismissed a week later. Perhaps the period of rest may even be shortened to two weeks.[17]

The patient should lie with outstretched legs, not bent over a roll, as the straight position in itself brings the ends of the pubic bones together; and the knees should be prevented by a bandage from separating so much (p. 202, Fig. 229, 4, and p. 544, Fig. 398) as to have any influence on the symphysis.

Experiments on animals have shown that the cells in the severed cartilage multiply at the expense of the hyaline substance and form a cicatrix of connective tissue, which slowly undergoes retrograde metamorphosis. In most cases there is a linear union without any appreciable enlargement of the symphysis, but in others there remains a fibrous band between the pubic bones. In such cases symphyseotomy has not only a passing, but a permanent effect on the size of the pelvis, which explains why some women, who had been delivered by symphyseotomy, in a subsequent pregnancy gave birth to a live child by normal labor. In a case in which symphyseotomy had been performed, the pubic bones separated two finger-breadths during the following labor and then retracted again.[18] Among twenty-five symphyseotomized women in the Leipsic clinic fourteen became pregnant again, and on only one the operation had to be repeated.[5]

It is highly gratifying to hear that in forty-seven symphyseotomies performed in the United States and Canada up to 1896, by forty-two different operators, perfect union and normal gait were obtained in every case.[14]

Bar[19] says that *decubitus acutus* is not very rare after symphyseotomy. This is a unilateral gangrene which sometimes complicates operations in which the nerves of the pelvis are pinched or otherwise irritated. On one side of the crest of the sacrum and the corresponding part of the nates appears suddenly an erythematous spot with a more or less regular contour, rather sensitive to touch, and accompanied by a pronounced swelling of the derma and subjacent tissues. There is a rise in temperature, and the general condition is bad. In the course of a few hours blebs filled with a reddish fluid are produced on the erythematous area, and in two or three days an eschar is formed as large, at least, as the hollow of the hand, and implicating all the soft parts down to the bone. Later this eschar is thrown off and the wound filled by granulation.

There is no necessity for any special diet, but great attention must be paid to cleanliness.

In a Naegele pelvis delivery has been accomplished by an operation called *ischiopubiotomy.* On the side where the ankylosis of the sacro-iliac joint is found, the pelvis is cut with a chain-saw in two places,—namely, in the ascending branch of the pubis 5 centimetres (2 inches) from the median line, and where the descending ramus joins the ascending ramus of the ischium.

The patient being in the dorsal position, with bent and separated knees, an incision is made parallel to the median line and at a distance from it of 4 centimetres (1⅗ inches) in the direction of the ankylosed sacro-iliac joint. The middle of this incision is on a level with the fourchette. The point where the descending branch of the pubis and the ascending branch of the ischium meet is exposed, rasped with a raspatory at the point where the chain-saw shall bite, which is passed behind the bone, from within outward.

In order to reach the horizontal branch of the pubis, the operator feels for the spine of the pubis and makes an incision in the abdomen, 4 centimetres (1¾ inches) from the median line and parallel to it, or about a finger's breadth outside of the spine of the pubis. This incision is 5 centimetres (2 inches) long. It begins fully a finger's breadth above a line drawn from the spine of the pubis to the anterior superior spine of the ilium. It lies outside of the external inguinal ring. The pectineus muscle is split; the bone is rasped with the raspatory and cut with the chain-saw.

After the bones are cut it is necessary bluntly to separate the obturator membrane along the outer border of the ischiopubic branches in order to obtain a separation of the ends.

By the gaping of these bones, combined with the mobility at the symphysis and the other sacro-iliac articulation, space enough is gained for the passage of the head.

Relation to other Operations.—Symphyseotomy ought to replace *craniotomy* on the living fœtus whenever it is possible to perform the former. Under such circumstances it would be next to murder to kill the fœtus; and even craniotomy, which deliberately destroys one of the two lives at stake in a delivery, is not without danger to the other. Even with skilful treatment, it is accompanied by a maternal mortality of 5.6 per cent.[20]

Induction of premature labor entails a maternal mortality of only 5 per cent., but then the infantile mortality is about 50 per cent. In cases in which the mother's life is to be preferred to that of the child, which is the rule, and we see the patient in time, recourse may, therefore, be had to induction of premature labor; but in cases in which the mother is particularly anxious to have a child, symphyseotomy within the above-indicated limits should be preferred.

The comparison with *Cæsarean section* will be taken up later, when we have described that operation.

Even difficult *forceps* and *version* operations ought to be replaced by symphyseotomy. If the true conjugate is less than 3 inches (7½ centimetres), it is better not to try to deliver with forceps, which may cost the life of the fœtus and, perhaps, that of the mother too. I have painful recollections of cases with generally contracted pelvis of the male type, in which with all my strength I extracted a dead child, and the mother died within a few days from sepsis. All those cases we read about of three strong men pulling at once or in succession on a pair of forceps inserted into a woman's pelvis ought to be relegated to the history of barbarous times.

If the true conjugate is less than 3¼ inches (8 centimetres), both version and the high forceps operation entail much greater danger for the life of both mother and fœtus than does symphyseotomy, to which must yet be added the danger of the child becoming idiotic or epileptic.

Symphyseotomy is of particular value to us in the eastern cities, where we so often meet cases of pelvis of the male type; and if the fœtus is unusually large, symphyseotomy comes in as a life-saving operation for both mother and fœtus, even when the pelvis is normal.

With a normal child the following rule, based on the length of the true conjugate, may be of some value: From 10.5 to 9 centimetres (4¼–3½ inches), forceps or version; from 9 to 7 centimetres (3½–2¾ inches), induced premature labor or symphyseotomy; from 7 to 5 centimetres (2¾–2 inches), Cæsarean section, if the fœtus is living; below 5 centimetres (2 inches), Cæsarean section, even when it is dead.

To these measurements, which are calculated for the plain flat pelvis, must be added at least 5 millimetres, or ¼ inch, if there is an appreciable narrowness in the transverse diameter of the brim.

Though we have mentioned as a strong point in favor of symphyseotomy, that it has a fair chance of success even when the patient has been long in labor and antisepsis has been indifferent, the chances are, of course, much better if the operation is performed early and before any infection occurs. Now that we know the limits of the operation, we ought in proper cases to urge its performance as soon as labor is sufficiently advanced. After that, delay only causes unnecessary suffering and suspense to the mother, adds to the danger of sepsis, and threatens the life of the fœtus.

Who shall perform Symphyseotomy?—Nobody should undertake this operation who is not an operative gynæcologist or a general surgeon with obstetric experience. In some cases serious hemorrhage has to be checked, in others severe injuries of delicate and important organs demand immediate repair, and in most the child has to be artificially revived from its asphyxia. But even with this restriction I do not doubt there are numerous practitioners in the United States capable of meeting all complications likely to arise in the performance of symphyseotomy. The operator must, however, have proper assistance, as described above, and there must be means of carrying out the after-treatment. As it is next to impossible to perform an aseptic operation in most private dwellings, especially those of the poor, who are much more likely to require symphyseotomy than the rich; as many skilled assistants are required; and as the after-treatment often is quite complicated; the chances with this, as with all major surgical operations, are much better in a well-equipped hospital than in private houses.

REFERENCES.

1. Treub, Annales de Gynécol., 1893, vol. xi. p. 377.
2. Tellier, quoted by M. L. Harris, Amer. Jour. Obst., 1894, vol. xxx. p. 762.
3. M. Paul Bar, Pathologie obstétricale, Paris, 1900, p. 94.
4. Polk, Centralbl. für Gynäkologie, 1899, vol. xxiii. p. 362.

5. Abel, Centralbl. f. Gynäk., 1900, vol. xxiv. p. 68.
6. Rubinroth, Obstetrics, 1899, vol. i. p. 664.
7. Bar, l. c., p. 105.
8. Pinard, Obstetrics, 1899, vol. i. p. 543.
9. Bar, l. c., p. 107.
10. Pinard, Annales de Gynécol., Jan., 1894.
11. Leopold, Obstetrics, Oct., 1899, vol. i. p. 544.
12. R. H. M. Dawbarn, Amer. Jour. Obst., 1896, vol. xxxiii. p. 359.
13. Porak, Annales de Gynécol., Sept., 1892.
14. E. A. Ayers, N. Y. Polyclinic, 1896, vol. vii. pp. 129–139.
15. M. L. Harris, Amer. Jour. Obst., 1894, vol. xxx. p. 760.
16. P. Zweifel, Centralbl. f. Gynäk., 1902, vol. xxvi., No. 13, p. 325.
17. Fieux, Obstetrics, 1900, vol. i. p. 657, and 1901, vol. ii. p. 248.
18. Pozzoli, Centralbl. f. Gynäk., 1899, vol. xxiii. p. 857.
19. Bar, l. c., p. 104.
20. Wyder, Archiv f. Gynäk., 1888, vol. xxxii. p. 60.

CHAPTER XIII.

GASTRO-ELYTROTOMY.

GASTRO-ELYTROTOMY, or *laparo-elytrotomy*,[1] has that in common with symphyseotomy that it was an attempt to avoid the nearly always fatal Cæsarean section, and that it was an old operation which had fallen into desuetude when in our time it was brought forth again in an improved shape. But, unlike symphyseotomy, it has been abandoned again, giving way for the revived symphyseotomy and the improved Cæsarean section.

Since now it has only historical interest, I should not mention it at all if it had not been during the short time of its revival a strictly American operation, reinvented, elucidated, and chiefly performed by American obstetricians; but since this is so, a brief reference to it may be justifiable in an American text-book of obstetrics.

The operation consists in making an incision through the abdominal wall parallel to Poupart's ligament, from the spine of the pubis to the anterior superior spine of the ilium, except the peritoneum. This is lifted until the uterovaginal junction is reached. The vagina is raised up to the wound with a steel sound passed within it, and cut, and the opening thus made is dilated with the fingers. The cervix is pulled into the wound with a blunt hook, while the fundus is depressed in the opposite direction, and the fœtus extracted with hand or forceps.

The first operation of this kind was performed by Ritgen in Germany in 1821. After having been abandoned on account of the bad results, it was improved by T. G. Thomas, of New York, in 1870, and performed at least fourteen times by him and his followers. The maternal mortality was 50 per cent., the infantile 43 per cent.[1] After the improvement in the Cæsarean section in 1883, the operation of gastro-elytrotomy was no longer used.

---

[1] Garrigues, "On Gastro-Elytrotomy," New York Med. Jour., Oct. and Nov., 1878; "Additional Remarks on Gastro-Elytrotomy, with Special Reference to Porro's Operation," Amer. Jour. Obst., Jan., 1883, vol. xvi., No. 1.

CHAPTER XIV.

CÆSAREAN SECTION.

Cæsarean section, or *laparohysterotomy*, is an operation in which the fœtus is delivered through an opening made in the abdominal wall and that of the uterus.

The operation was performed after death in the classic antiquity. On the living woman the first authentic operation was performed in 1610 in Wittenberg in Germany. We have spoken above (p. 551) of its use after the death of the mother. It remains to discuss its applicability to the living woman and describe its technique.[2]

Indications.—There is an absolute and a relative indication to perform Cæsarean section. The *absolute* indication holds good, whether the fœtus is alive or not. It is present when the fœtus, even after craniotomy, cannot pass the genital canal, or when the disproportion between the fœtus and the canal is so great that the delivery through the normal passage would entail greater dangers to the mother than the Cæsarean section.

This indication may be due to tumors that cannot be replaced or diminished, but in general the cause is a high degree of deformity of the pelvis, mostly of rhachitic or osteomalacic origin.

If the smallest diameter is less than 2 inches (5 centimetres), there is absolute indication for Cæsarean section. Much advanced carcinomatous degeneration of the cervix may also come into this category (p. 295).

The *relative* indication may be present when the smallest diameter measures between 2 and 3 inches (5 and 8 centimetres), but is bound to certain *conditions:*

1. The fœtus must be alive, viable, and not materially deformed.

---

[1] Wyder, Archiv für Gynäkologie, 1888, vol. xxxii. p. 76.

[2] Garrigues, "The Improved Cæsarean Section," Amer. Jour. Obstetrics, vol. xvi., April, May, June, 1883 (author's first case); "The Improved Cæsarean Section," ibid., vol. xix., Oct., 1886; "The Improved Cæsarean Section," Amer. Jour. Med. Sci., May, 1888 (author's second case); "A Case of Improved Cæsarean Section," Clinical Recorder, vol. i., No. 1, Feb., 1896 (author's third case); "The Technique of the Improved Cæsarean Section," International Jour. of Surgery, March, 1896.

A hydrocephalic fœtus, for instance, should be diminished by craniotomy.

2. The mother must be in good condition. Labor must not have been too protracted, say not over twenty-four hours. No very active attempts at delivery with forceps must have been made. The case must have been treated with antiseptic and aseptic precautions, and it must be reasonably sure that no infection has taken place. Otherwise symphyseotomy or craniotomy must take the place of Cæsarean section, for under such circumstances the mortality becomes so great that the operation is no longer justifiable.

3. The accoucheur must explain to the patient that unless something is done, both she and her child are lost.[1] If it is a favorable case, he may in good conscience tell her that it is nearly certain that the child will be saved and that her own risk is small provided Cæsarean section is resorted to without unnecessary delay. But if the case is one that comes within the scope of symphyseotomy, and this can be performed, he must tell her so, and state the chances for mother and child. And, finally, he must tell her that perhaps her life may be saved if that of the child is destroyed by craniotomy, supposing he is willing to perform this operation on the living fœtus.

Modus Operandi.—All precautions known to aseptic and antiseptic surgery should be taken, preferably in the following way. Operating-gowns and caps, towels, gauze pads, and silk are sterilized by moving steam. The operator and his assistants disinfect their hands and arms as described above (pp. 188–190). Those accustomed to operate with rubber gloves had better don them for the occasion. The bowels are emptied before the operation with an aperient and an enema, and at the last moment the urine is drawn with a catheter. The patient is anæsthetized, the vulva and abdomen shaved and disinfected in the same way as the operator's hands. The vagina is disinfected by pouring sterilized tinctura saponis viridis into it, rubbing it with a ball of absorbent cotton or a gauze pad held in a dressing-forceps, and pouring a copious amount—several quarts—of bichloride of mercury solution (1 : 2000) into it, followed by lysol emulsion (1 : 100). The instruments are boiled with soda (p. 594) and kept on a sterilized towel.

The temperature of the room should be about 80° F. The patient should be warmly dressed and placed on her back on a narrow table covered with quilts or blankets, a rubber sheet or oil-cloth, and a common sheet. Her legs are bent at the knees, and the feet placed on a stool at the end of the table, so that the assistant who takes care of the constrictor may have easy access to the womb without being in the way of the operator and the other assistant. The field of operation is surrounded by four sterilized towels, pinned together and to the clothes of the patient.

---

[1] European text-books speak as if in a case of absolute indication for Cæsarean section the operation should be performed with or without the consent of the woman. In America the law demands that the operator shall obtain the patient's consent to perform any surgical operation on her person. To do Cæsarean section on her against her will would be a felonious assault, and if she died in consequence of the operation the surgeon would be guilty of murder.

By percussion the operator satisfies himself that no knuckles of intestine lie in front of the uterus, or he pushes them aside. An incision is made in the median line half above and half below the umbilicus, passing to the left of the same. It severs first the skin, then the subcutaneous adipose tissues, then the linea alba, and finally the preperitoneal fat. Bleeding vessels are clamped with artery-forceps. Next, the peritoneum is lifted up with two such forceps, and a small incision made in it, through which the index-finger is passed into the abdominal cavity, and the peritoneum slit open to the same extent as the skin. The incision should be just long enough to turn out the uterus, and, on account of the elasticity of the abdominal wall, the opening need not by far be so long as the uterus, but only about six or seven inches (15–18 centimetres).

Next, the right hand is introduced into the abdominal cavity and used to turn out the uterus, seizing it by the left corner. If necessary, this movement may be aided by pressure from the vagina. Before pulling out the uterus, three or four long silk sutures are inserted through the lips of the abdominal wall above the umbilicus, an inch apart. The two ends of each are clamped together. As soon as the uterus is lifted out, these sutures are closed, which serves to keep the intestine and the omentum away from the field of operation.

A rubber tube, about as thick as the little finger and half a yard long, is laid loosely around the cervix and the broad ligaments outside of the appendages and crossed, but not tied, so that the assistant in charge of this constrictor can easily tighten or loosen it according to circumstances.

The uterus is enveloped in a sterilized cloth wrung out of hot normal salt solution, and a large dry gauze pad is placed in front and behind, under which it is well, if the membranes are entire, to lay a piece of sterilized gutta-percha tissue.

At the moment the incision is begun, the constrictor is tightened. The incision is made in the median line of the anterior wall of the uterus, so as to avoid the cervix and lower uterine segment, where there are large veins and much less contractility. Above it must extend far enough to allow the hand to be introduced and the fœtus to be withdrawn with ease,—say, from 4½ to 5½ inches (12–14 centimetres). This incision is made with many repeated strokes. It is best to begin with a convex, sharp-pointed bistoury, and when an opening is made into the cavity the left index-finger is introduced, and the incision extended on it with scissors or a probe-pointed bistoury. Bleeding sinuses are clamped. If the placenta is inserted on the anterior wall, the incision is carried through it.

If the waters have not broken, the operator tears the ovum near the lower end of the incision, taking care that none of the fluid enters the peritoneal cavity, especially if it is decomposed or contains meconium. If the waters have drained off before the operation, the operator should take particular care not to wound the fœtus in making the incision.

When the ovum is opened, the operator introduces his right hand, and, if possible, delivers the head of the child first, whereby the danger of the uterus contracting in front of it is avoided. If this is not easily done, he seizes an extremity or the body and pulls the child out of the uterus. The cord is tied immediately with two ligatures and cut between them, and the child is handed to a competent nurse or preferably a physician, who, if necessary, employs the usual means of reviving it (p. 559), while the operator continues to bestow his attention on the mother.

If the placenta is cast loose, he seizes it and peels off the membranes from the interior of the womb, so as to have all the afterbirth in one piece. If, on the other hand, the placenta still adheres to the wall, he leaves it alone, and inserts deep silk sutures half an inch from the edge through the whole uterine wall, except the decidua. There ought to be about ¾ inch (2 centimetres) between each two sutures. The ends of each are clamped together. By the time this is done the placenta will probably have been cast off; but, if it has not yet separated, he peels it off like the membranes, which always are adherent, before tightening the sutures.

If the operation is performed before the cervix is dilated, this should be done now manually, so as to insure free drainage from the uterus to the vagina.

If any part of the fœtus or the membranes has been caught in the constrictor, this must temporarily be loosened.

For the sutures I think sterilized silk is the best material, a medium thick—braided No. 4—for the deep, and a fine—braided No. 2—for the superficial. Silver wire is also good, but takes more time, and catgut knots are liable to reopen by the alternation of contraction and relaxation of the uterus.

In tightening the deep sutures, the serous surfaces of the peritoneum should be adapted to each other, so as to lie on the top of the wound, but not drawn in between the cut surfaces of the muscular tissue.

When these deep sutures have been tied, superficial ones, only comprising the peritoneum, are inserted midway between each two of the deep. They are likewise inserted half an inch from the edges, but are pushed out again a quarter of an inch from the latter and inserted in a similar way on the opposite side, so as to apply broad surfaces against each other.

After the removal of the after-birth, clots are removed from the interior of the womb, and it is simply wiped dry. No antiseptics are needed, nor should the uterus be curetted.

For passing the deep sutures medium-sized, round, trocar-pointed, curved needles are the best; for the peritoneum a finer, round, curved, simply pointed needle is preferable.[1]

All sutures being tied, the elastic constrictor should be loosened very slowly, since a sudden rush of blood into the uterus is apt to cause hemorrhage. Nor should the constriction be kept up longer than absolutely necessary, as it is apt to cause atony of the uterus. Hemorrhage may have its source in the wound or on the placental site.

The uterus ought not to be replaced into the abdominal cavity until all bleeding has stopped. If there is any, it is checked by compression with a hot sponge, by squeezing the uterus, by pouring hot normal salt solution over the outside of it, by adding supplementary sutures under the bleeding spots, or, if necessary, by administering an intra-uterine injection of normal salt solution or hot water with the addition of creolin or liquor ferri chloridi (1 per cent.). If simple interrupted sutures do not suffice to check hemorrhage, a mattress-suture may be substituted. A curved needle is introduced on a line with the other sutures, passed under the bleeding sinus and out on the same side. A similar suture is inserted at the corresponding point of the other lip of the wound, and in tying the sutures the two upper ends are united, and so are the two lower ones. It may also be done with a single thread, going from above downward on one side and from below upward on the other.

If it is impossible to check the hemorrhage, which is exceedingly rare, nothing else is left than to amputate the uterus by Porro's operation (see below).

When all bleeding has ceased, the constrictor is removed, the peritoneal cavity is cleaned with gauze pads held in long forceps, and if decomposed liquor amnii has got into it, it is washed out with plenty of warm normal salt solution. The same should be done, if much meconium has found its way into the peritoneal cavity; but if only a little has entered, it is better to wipe it off dry and leave an iodoform gauze drain in the lower end of the incision. The uterus is replaced and the omentum pressed up above it, in order to avoid adhesions that may lead to intestinal obstruction. The abdominal wound is closed with deep sutures, comprising the whole thickness of the wall, and in passing them particular care is taken to include the aponeurosis of the abdominal muscles and the peritoneum. They are passed at intervals of an inch, and superficial ones, through the skin alone, between them. For the deep abdominal sutures I prefer silkworm gut, for the superficial fine silk. It is most convenient to use a large, semicircular Hagedorn needle for closing the abdominal wound.

---

[1] John Campbell, 228 Lexington Avenue, corner Thirty-fourth Street, New York, keeps these needles in stock under my name.

Dressing.—The line of incision is dusted with eka iodoform and covered with a pad of iodoform gauze. Outside of this and overlapping it an inch in all directions comes a piece of gutta-percha tissue, which adheres closely to the skin. On top of that are placed pads of sterilized gauze, a layer of absorbent cotton, held in place by broad straps of adhesive plaster, and, finally, a many-tailed muslin bandage.

The genitals and anus are covered with my antiseptic pad as in normal deliveries, which pad is fastened to the abdominal bandage and changed four times a day or oftener.

After-treatment.—The patient is placed in a bed with half a dozen bottles filled with hot water, especially near the hands and feet.

When she comes out from under the anæsthesia, *vomiting* often is an embarrassing symptom. The patient should then be made to make deep inhalations with acetic acid, which expels the remnants of the anæsthetic from the deeper part of the lungs. A few mouthfuls of strong, black coffee and the administration of the compound tincture of iodine, ♏1 every hour, have proved most efficacious to the author. Otherwise she is only given teaspoonfuls of hot or ice-cold water. Other useful remedies are cocaine, hydrocyanic acid, nux vomica, creosote, carbolic acid, aerated mineral waters, cracked ice, champagne, counter-irritation of the pit of the stomach, etc.

If there are signs of *shock*, strychnine (gr. $\frac{1}{30}$—2 milligrammes—repeated till gr. $\frac{1}{10}$—6 milligrammes—has been given), tincture of digitalis (♏x—60 centigrammes—repeated till ʒss—2 grammes—has been used), and nitroglycerin (gr. $\frac{1}{100}$—0.6 milligramme—until gr. $\frac{1}{25}$—2.4 milligrammes—has been administered) should be injected hypodermically. Camphor dissolved in four parts of sterilized olive oil may be injected (ʒss—2 grammes) into the deltoid or vastus externus muscle. Injection of hot saline solution under the skin, into the rectum, or into a vein is especially valuable if much blood has been lost during the operation. The foot of the bed should be raised, so as to insure a proper supply of blood to the brain.

Secondary hemorrhage may occur during the lying-in period, and should be treated with hypodermic injection of stypticin or ergot, and intra-uterine injection with hot normal salt solution, if necessary with diluted liquor ferri chloridi. Simultaneously extract of suprarenal capsule, or adrenalin, may be given by the mouth (p. 514).

The patient should be kept on fluid diet for a week. If vomiting continues, she should have nothing but cold milk or its derivatives,—peptonized milk, kumiss, zoolak, or junket,—and always in very small quantities. In a very obstinate case rectal alimentation might be resorted to. Appropriate mixtures for this purpose are an egg beaten up with four ounces of milk, with or without addition of an ounce of whiskey; or four ounces of lean beef—adding water enough that the mixture can be injected with a Davidson's syringe. After the first week the patient may have full diet.

If the temperature rises, ice-bags are applied to the head and a coil with ice-water to the abdomen. Antipyretic drugs are all weakening and should, therefore, generally be avoided. Peritonitis is treated either with large doses of morphine or perhaps preferably with sodium sulphate. If the presence of a collection of pus around the uterus is diagnosticated, the lower end of the abdominal incision should be opened, a hole made into the vagina, and drainage established, combined with antiseptic injections; or an incision may be made in the vagina from below and drainage secured in that way.

The bowels are moved on the third day. The abdominal dressing is changed once a week. The sutures are removed on the eighth day and replaced by narrow strips of adhesive plaster. The patient stays in bed for three weeks, and should wear a well-fitting and not too yielding abdominal supporter, such as Teufel's (Fig. 240, p. 240) for the next three months.

On the above pages I have described the operation with all the details I have followed in my own operations.

The improved Cæsarean section is a beautiful outgrowth of general surgical and special gynæcological development, an evolution due to the combined efforts of many men working independently of one another in different countries. I do not know of any greater mistake than to attach a single man's name to it. In a special paper I have shown that every step in this operation had not only been used by surgeons and gynæcologists in other operations, but had been applied to Cæsarean section before the year 1882, from which the new era for the operation dates.[1]

There are many modifications of the way of operating, to discuss which is not within the scope of a work of this kind; but one is so important and has been so successful that it calls for recognition even in a text-book.

[1] Garrigues, Amer. Jour. Obst., 1886, vol. xix. pp. 1009–1022.

Fritsch's Method, Transverse Incision.—Professor Heinrich Fritsch, of Breslau, Germany, makes the incision in the uterus transversely through the top of the fundus from one Fallopian tube to the other. This seems to offer several advantages. In the first place, the placenta being, as a rule, inserted on the anterior or the posterior wall of the uterus, there is better chance of avoiding it by making the incision at the fundus than when it is made in the median line. Secondly, the fundal incision avoids altogether the lower uterine segment, which often has given rise to troublesome hemorrhage, and the limit of which cannot be made out before the contraction ring forms. Thirdly, the chief course of the uterine vessels being from the edges to the median line, a transverse incision is likely to cut fewer of them than the longitudinal one. The results have been excellent: of forty-seven patients on whom the method was used in conservative Cæsarean section, only three died; that is a mortality of 6.38. If the operation is performed on account of the size of the child, the longitudinal incision should, however, be preferred, since the incision may be continued upward as much as the case may require, while in the transverse fundal method the length of the incision is limited by the large vessels running along the edge of the uterus.

Anatomical and Physiological Observations.—Before being incised the uterus is of purple color, and the tightly stretched peritoneal covering reflects light like a polished surface. The fundus forms a semicircular dome, and the tubes and ovaries are drawn away up in the abdominal cavity (Fig. 118, p. 86). During the incision the edges of the wound retract, so as to form a large gaping opening with bevelled edges, the outer muscular layer being more retracted than the inner. At the bottom of this gap lies the ovum as a transparent grayish bag, inside of which the fœtus is seen indistinctly. When the membranes are ruptured, the uterus contracts so as to clasp its contents tightly. After the removal of the fœtus it contracts again, so as to measure only 6 or 7 inches (15–18 centimetres) from os to fundus. The more it contracts the thicker the wall becomes, and measures at last about 1½ inches (4 centimetres).

After the uterus is emptied, the peritoneum shrivels up and lies in wrinkles. It is of waxy-gray color, and has lost all its former gloss. In most cases it can easily be lifted up and pushed to and fro.

The cut surface has a grayish-brown color like half-boiled meat, and on it appear the contracted sinuses as round cherry-colored spots, ⅛ inch (3 millimetres) in diameter.

Douglas's pouch is much shallower than in the unimpregnated condition.

The placenta lies, as a rule, loose, a natural consequence of the diminution of the surface to which it is attached. The membranes, on the contrary, remain fastened to the inside of the uterus, and have to be peeled off by inserting a finger between them and the wall. On account of their thinness and great elasticity they adapt themselves to the size of the surface on which they have grown, which the placenta under normal circumstances cannot do. The separation between the uterus and the membranes takes place in a white spongy substance that easily breaks under the advancing fingers.

After the removal of the placenta and the membranes, the inside of the uterus is entirely smooth. When the constrictor is loosened the uterus becomes violet.

If no drainage has been provided for at the time of the operation, and the condition of the patient—high temperature or collapse—points towards gaping of the wound or oozing into the peritoneal cavity, it is advisable to open the abdominal wound at the level of the fundus, and introduce a rubber drainage-tube or a gauze or wick drain behind the uterus, and others from the lower end of the incision into each side of the uterovesical excavation; but this procedure may disturb useful adhesions already formed, and the fluid may have gravitated into parts which are not reached by the drains, or it may have been brought all over the peritoneum by the peristaltic movement. Too much benefit should, therefore, not be expected from this tardy drainage.

Time.—The most favorable moment for performing Cæsarean section is probably the end of the first stage, when labor-pains are well developed, the cervix fully dilated, and the membranes unruptured. But it may be difficult or impossible to watch the case until this favorable moment arrives, or to have the necessary assistance at that hour, and experience has shown that the operation may be safely performed several days before the expected confinement. The incision itself is a powerful stimulus to uterine contraction. In cases in which it is known beforehand that Cæsarean section is to be performed, this is the best plan to follow. It finds its application with dwarfs, and other women in whom there is so manifest a disproportion between the fœtus and the pelvis that it is evident that delivery can be accomplished only by means of this operation. It is also applicable to multiparæ who offer a history of the death of the fœtus in previous confinements, on account of mechanical disproportion. But with most primiparæ the situation is different. It is the labor itself that reveals that the woman cannot give birth to her child, and the operation, if it is advisable at all, has to be performed at the time when we come to the conclusion that it is indicated.

Under such circumstances the patient should be anæsthetized, and a thorough examination made, with the whole hand, of the pelvis of the mother and the head of the fœtus. Next, it is well to place the woman in Walcher's hanging posture, and let an assistant try to press the head down into the brim, which, however, can be done only after the rupture of the membranes.

Place.—If possible, the operation should be performed in a good hospital, as the chances for aseptic work are infinitely better there than in private houses, especially the dwellings of the poor, who are much more likely to need Cæsarean section than the wealthy.

Operator.—Who should perform Cæsarean section? Of course the best man available. The strikingly excellent results that have marked the operation of late years have been obtained by men with large experience in gynæcological operations. But it is evident that often it must be performed by a person with average surgical skill, and it is, therefore, gratifying that it really is a simple operation which has, in a rude form, been done by persons without surgical training and even by the patient herself. It is because the operator may not be an expert, but a common general practitioner, that the writer has gone into so many details in describing the way of operating and chosen the simplest and most expeditious means of reaching the goal. As a matter of fact, the operation has been performed with a razor, a darning-needle and thread, a simplicity which under circumstances may be imperative and may give relief from excruciating pain and save one or two lives.

A good uterine suture, be it applied in one way or another, is not only an immediate protection against hemorrhage and oozing of uterine contents into the peritoneal cavity, but it is also of great value for the future, as experience has shown that a uterus which has been submitted to Cæsarean section is liable to rupture in subsequent pregnancies, and the seat of rupture is preferably the cicatrix left by the operation.

Adhesions form between the wound in the anterior wall of the uterus and the abdominal wall. Sometimes these are later lengthened and reabsorbed, but in other cases they become permanent, and may have such dimensions that another Cæsarean section may be performed through them without opening the peritoneal cavity. This is one reason more why the omentum should not be drawn down between the uterus and the abdominal wall.

The question arises, whether, in performing Cæsarean section, we should remove the appendages, and thereby protect the woman against all the dangers of subsequent pregnancies. It might be done in a few minutes, but the writer looks upon this as an undesirable complication of the operation. After salpingo-oöphorectomy the patient has considerable pain for a whole week, which probably comes from the constriction of nerves in the pedicles. Two stumps are left which cannot be nourished before new channels of blood supply have been formed. The removal of the ovaries often has an undesirable effect on the whole organism. Adhesions may form around the stumps and become a source of divers troubles. Those to the bladder may cause a frequent desire to urinate. Those to the intestine may provoke pain and lead to intestinal obstruction. The sexual appetite may become uncomfortably increased, diminished, or disappear. Many women become fat and dyspeptic after being spayed.

Experiments on animals have shown that the removal of the ovaries has a marked effect on metabolism. The phosphates eliminated with the urine and the carbonic acid contained in the expired air diminish, while the weight of the body increases. In a large percentage melancholia has developed in castrated women. Congestion of the head and thoracic organs and perspiration appear soon after oöphorectomy and may continue for years. Other disturbances that have been noticed are loss of memory, irritability of temper, diminution of the power of vision, a more masculine voice, skin affections, nightmare, and insomnia.

If the patient shall be rendered sterile it is better to ligate the tubes. But it is doubtful whether on moral grounds it is justifiable gratuitously to deprive a woman of the possibility of becoming a mother. Thus, taking everything into consideration, I think it is better to limit Cæsarean section to the safe termination of the present pregnancy and not to include in it any kind of measure tending towards prevention of future pregnancies.

It is better not to fold the peritoneum in over the edge of the incision. The muscular surfaces grow better together when it is not done ; but when the peritoneum is movable enough to do so, it is an advantage to unite it outside of the incision in the muscular tissue, where it serves as a curtain and contributes to the perfect closure of the wound in the uterus.

If there are signs of decomposition of the uterine contents, or a diseased endometrium, the uterus should be mopped and washed with an antiseptic solution, and a rubber drainage-tube or iodoform gauze drain should be led from the uterus to the vagina, unless the operator thinks it is wiser to remove the whole organ by Porro's operation.

Cæsarean section has been *repeated* on the same patient, even as often as four times. The prognosis for the repeated operation is much better than in the first. Sometimes this may be due to adhesions. Perhaps the peritoneum also becomes less sensitive. But the chief cause is probably to be sought in the good constitution of the patients: those who have gone safely through the ordeal are hardy natures which do not easily succumb to influences that might overwhelm others.

In exceptional cases Cæsarean section has been followed by normal labor in subsequent pregnancies, but there is great danger of the uterus rupturing, either in the cicatrix or in another place.

Prognosis.—All statistics from pre-antiseptic times, when Cæsarean section was nearly always a fatal operation, have now only historic interest. A competent man, working under favorable circumstances, on a suitable case, need fear no mortality from Cæsarean section. But this assertion might give an erroneous impression if it were not mitigated by a statement of the actual results obtained, as far as they are known. Some years ago Dr. E. Reynolds collected twenty-two cases operated on in Boston by himself and others, in which all mothers and children were saved.

But though some gynæcologists have escaped mortality, others, not less experienced, and working under the most favorable surroundings, have a mortality of from 10 to 12 per cent. Uniting the results of eleven renowned operators, we find 346 operations with 23 deaths, or 6.6 per cent. But Cæsarean section is not performed only by great experts in model hospitals. We must see how the operation works in the hands of the profession at large. According to Frommel's Annual Report, there were during the last ten years 551 cases, of which 105 ended fatally, or 19 per cent.; and with all operations successful cases are more likely to be put on record than those ending in death.

In regard to the fœtus the prognosis is good. If it is in good condition at the time of the operation, it ought to be brought into the world alive, since the operation itself does not contain any element of danger to it. Still, the same statistics we just referred to show a fetal mortality in the hands of experts in model hospitals of about 5.7 per cent., and in the profession at large of 7.5 per cent.

Relation to other Operations.—Cæsarean section enters chiefly in competition with symphyseotomy and craniotomy. In Cæsarean section the fetal mortality is only about one-half of what it is in symphyseotomy—7.5 per cent. compared with 14; but, on the other hand, the maternal mortality is considerably larger—19 against 11. In symphyseotomy injuries may occur which cause a protracted convalescence; but after Cæsarean section there is often long suffering caused by the adhesions, and the abdominal wound may lead to ventral hernia. Symphyseotomy gives more trouble in the beginning, Cæsarean section later on. Cæsarean section is easier to perform, and the after-treatment is very much simpler. But Cæsarean section has an enormous mortality in unfavorable cases,—that is, when the labor has been protracted, the patient is exhausted, fruitless attempts at delivery have been made, and antiseptic and aseptic precautions have been unsatisfactory; while these cases yet offer a fair chance for recovery if symphyseotomy can be performed and is indicated. Cæsarean section is apt to cause shock, not so symphyseotomy.

We have said that with a true conjugate of less than 2 inches (5 centimetres) Cæsarean section should be performed, whether the child is alive or dead. If the true conjugate is between 2 and 3 inches (5–7½ centimetres) or the child is abnormally large, Cæsarean section should be performed in favorable cases. If the case is unfavorable, and the pelvic dimensions are large enough for symphyseotomy, that operation should be tried. But if the mother refuses to be operated on, there is nothing else left than *craniotomy.*

Cæsarean section may even, like symphyseotomy, take the place of difficult *forceps* or *version* operations, as these have a much larger mortality for the fœtus and often cost the mother her life.

The surroundings, the possibilities for assistance and after-treatment, and the financial condition must, independently of purely scientific considerations, have considerable influence on the choice of the operation to be performed. A man working in a good hospital, with all desirable assistance at command, having to deal with uncontaminated cases, may prefer the comparatively simple operation of Cæsarean section to symphyseotomy, and is justified in absolutely refusing to perform craniotomy on the living fœtus. In private city practice we shall oftener have use for symphyseotomy, but in country practice, where the physician perhaps comes from a long distance, where skilled assistance is difficult to obtain, where there are numerous obstacles in the way of intelligent after-treatment, the practitioner will probably often have to resort to craniotomy even in cases that would be suitable for Cæsarean section or symphyseotomy.

CHAPTER XV.

UTERO-OVARIAN AMPUTATION.

UTERO-OVARIAN AMPUTATION, or *supravaginal amputation*, is a Cæsarean section followed by hystero-oöphorectomy.[1]

In contradistinction from the conservative, or classic, Cæsarean section, this is a mutilating operation, by which the patient is deprived of her uterus, tubes, and ovaries. When the Italian obstetrician Porro introduced it in 1876, it was received with considerable favor. Although the mortality in the beginning was 56 per cent., that seemed a decided progress compared with Cæsarean section as it was then, and its friends even looked upon the spaying of the patient as one of its advantages. According to them, a woman who cannot give birth to a child has no right to have any. But how often do we not find, even among poor people, the natural desire for offspring strongly developed? How often is not a marriage unhappy because it is childless? How often is not the married woman despised because she has no children? And who can tell of what he deprives humanity by producing artificial sterility?

---

[1] Garrrigues, "Additional Remarks on Gastro-Elytrotomy, with Special Reference to Porro's Operation," Amer. Jour. Obst., Jan., 1883, vol. xvi., No. 1.

Indications.—Porro's operation should, therefore, not be looked upon as a substitute for the conservative Cæsarean section, but should be reserved for special cases:

1. When a patient has a myoma that soon would require myomotomy;
2. When there are so extensive vaginal cicatrices that they form a barrier to the outflow of the lochial discharge;
3. When the uterus is infected, or has suffered much by the vain efforts of natural labor or unsuccessful attempts at delivery by other methods;
4. When the fœtus has become decomposed;
5. When it is impossible in any other way to control the hemorrhage after the conservative Cæsarean section;
6. Rupture of the uterus, if abdominal section is indicated, and suture of the uterine wound does not seem safe.

Some add osteomalacia, but since it is only the ovaries that have the disastrous effect on the bones of the pelvis, it is much safer, if the uterus is healthy, to leave it and only remove the adnexa.

Modus Operandi.—The first step is to perform Cæsarean section. The second is to amputate the uterus and its appendages. The stump may be treated by the *extra-abdominal* method or the *intra-abdominal, retroperitoneal* method.

1. *The Extra-abdominal Treatment of the Pedicle.—Porro's Operation.*—This is entirely like the treatment of the pedicle in myomotomy by Hegar's method.[1]

In this case the elastic constrictor is intended to remain until the stump falls off, and is, therefore, fastened in a permanent and reliable way. The rubber tubing is laid twice around the cervix, drawn very tight, and crossed once. Then the ends are seized in front of the crossing with a strong pressure-forceps and tied together with a stout silk ligature behind the forceps. When this is tied, the ends of the elastic ligature are pulled out a little more, and a second ligature is placed at some distance behind the first, and all the ends of rubber and silk ligatures are cut short. But in order to avoid asphyxia the fœtus should first be helped out before the tubing is secured in such an elaborate way. If it is dead, it is better not to open the uterus at all, in order to avoid infection of the peritoneal cavity.

---

[1] Garrigues, Diseases of Women, third ed., p. 519.

Another way of securing the tubing is to have an assistant lay the silk ligature on the top of the first half-hitch of the knot, at right angles to the elastic ligature; next, to tie this with a second hitch; and, finally, to tie the silk ligature across the second crossing of the elastic ligature.

As soon as the uterus is emptied, it is well, in order still more effectively to guard against contamination, to pack its cavity with sterilized gauze. The manipulation of this organ is much facilitated by fastening a traction-forceps in each edge of the incision.

Next, the uterus and the broad ligaments with the adnexa are cut off from one and a half to two inches (4–5 centimetres) above the elastic ligature. The cervical canal is disinfected by touching it with undiluted carbolic acid. All arteries seen on the cut surface, especially the uterine, the ovarian, and the azygos, should be seized and tied separately, and the peritoneal covering of the stump stitched with a fine, curved, round needle and a continuous catgut suture to the peritoneum near the lower end of the abdominal incision, under the ligature, so as to close the peritoneal cavity. The remaining peritoneal edges are stitched together, and the abdominal wound is closed as in other laparotomies,[1] leaving a circular furrow, formed by the receding muscular, fascial, adipose, and cutaneous layers of the abdominal wall.

In order to avoid the dangers of infection as much as possible, the amputation of the uterus may to advantage be postponed until the peritoneum has been stitched to the stump and its borders united above it.

The stump is transfixed with a pair of steel pins crossing one another above the ligature, which they prevent from slipping, and at the same time they avert drawing-in of the stump into the abdominal cavity. In order to preclude pressure against the abdominal wall, a little gauze is put under the needles. The cut surface, as well as the surrounding furrow, is covered with a mixture of 3 parts of tannin with 1 part of salicylic acid. Finally, the wound is dressed as after conservative Cæsarean section and other laparotomies.

The stump falls off after fifteen to twenty days, leaving a deep, funnel-shaped depression, the necrosis extending beyond the elastic ligature. This surface is dressed daily with iodoform gauze until it is healed.

In leaving the above-described furrow free between the stump and the abdominal wall, except the peritoneum, a great source of infection and death has been eliminated; but, on the other hand, a weak point is left in the abdominal wall, and it is necessary for the patient to wear an abdominal supporter.

If the accoucheur does not feel competent to do the peritoneal suturing, or if the patient's condition imposes the utmost speed, the abdominal wound may simply be closed around the stump with interrupted sutures, and then the whole operation is simpler and more expeditious than conservative Cæsarean section.

---

[1] Garrigues, Diseases of Women, third ed., p. 649.

2. *The Intra-abdominal, Retroperitoneal Method.*—The extra-abdominal treatment is the original Porro operation, and recommends itself as the simplest, most expeditious, and safest, but the intra-abdominal method has the great advantage that the abdominal wound is entirely closed, and no tissue undergoes necrosis. The procedure is exactly the same as in supravaginal amputation for myoma,[1] but on account of the size of the blood-vessels during pregnancy, hæmostasis is more difficult.

After having delivered the child and before excision of the womb, a flap of peritoneum is dissected off in front and behind from the uterus. When the uterus has been cut off and the arteries on the cut surface tied separately, the lips of the cervix are stitched together and then the two peritoneal edges are united by a running symperitoneal suture along the whole wound. Next the elastic constrictor is removed, the pedicle dropped into the abdomen, and the incision in the abdomen closed.

If the uterus is infected, the extra-abdominal treatment is the better one, but with an aseptic uterus the intra-abdominal retroperitoneal method is preferable.

Utero-ovarian amputation may be performed at the time convenient for the operator. Everything needed can be prepared at leisure, and the operation can be done before the patient has lost any of her strength by ineffectual efforts at delivery through the natural passages. But often the obstetrician does not see the patient until after she is infected, and an immediate operation is her only chance of recovery.

Prognosis.—Not long ago utero-ovarian amputation had a maternal mortality of 37 per cent., but it must be remembered that the operation is frequently chosen because the case is too bad for the conservative Cæsarean section. During the last few years there have been performed 111 Porro operations by great operators with a loss of only 11 women,—that is, about 10 per cent.

Utero-ovarian amputation causes still more shock than the conservative Cæsarean section. The hæmostasis often has proved very difficult. There is great danger of peritonitis and septicæmia. Other mishaps met with have been non-union of the pedicle, tetanus, pulmonary œdema, hyperpyrexia, heart-clot starting from a femoral thrombus, etc.

The infantile mortality varies much with the mother's condition, but it is always great. Modern statisticians give it as 16, 21, or 24 per cent.

---

[1] Garrigues, Diseases of Women, third ed., p. 518.

Apart from the immediate result, the extirpation of the internal genitals has often, as stated above (p. 668), a bad influence on the general health.

CHAPTER XVI.

PANHYSTERECTOMY.

Some obstetricians have gone one step farther and extirpated the whole uterus, inclusive of the cervical stump, which complicates the operation still more.

§ 1. **Abdominal Hysterectomy.**—*Indications.*—The indications are chiefly the same as for supravaginal amputation: (1) Death of the fœtus with infection of the uterus; (2) vaginal cicatrices that prevent the free discharge of the lochia; (3) a myoma of the cervix that cannot be enucleated at the time of the operation; (4) rupture of the uterus under the above-mentioned conditions (see pp. 531, 671).

If there is an inoperable carcinoma of the cervix, it is better to perform supravaginal amputation and leave the neoplasm alone, or to curette and cauterize the cervix and deliver by Cæsarean section.

The total extirpation of the uterus offers the advantage over any kind of utero-ovarian amputation that the danger of infection is minimized, and, compared with the extraperitoneal method of the treatment of the stump in Porro's operation, there is less danger of intestinal obstruction, a shorter convalescence, and less danger of consecutive ventral hernia. But in spite of these great benefits the writer hesitates to recommend the operation to the profession at large. Obstetric operations ought to be as simple as possible. They obtrude themselves on the general practitioner when they are not expected, and he has often to act under highly unfavorable surroundings and with deficient assistance. Every practitioner who can amputate an arm or a leg can perform the conservative Cæsarean section. Porro's operation in the strict sense of the word—utero-ovarian amputation with extra-abdominal treatment of the stump—is even simpler. But when we come to the intra-abdominal treatment of the stump, we enter on the domain of the highest gynæcological work, and this is still more the case with the total oöphorohysterectomy.

Modus Operandi.—The vagina is packed with gauze in order to lift it and mark the line of demarkation between it and the cervix. The abdominal incision is made long enough to allow the operator to lift the uterus out with its contents. The elastic constrictor is put around the cervix, and Cæsarean section is performed as described above, but the uterus is only closed with deep sutures in order to prevent hemorrhage from the wound during the following extirpation of the uterus.

The patient is placed in the elevated-pelvis position. The operator stands on her left side and his assistant opposite to him. The top of the uterus is seized with a strong traction-forceps and drawn by the assistant over to his side. The left infundibulopelvic ligament containing the ovarian vessels is tied, a clamp put inside of the ligature, and the ligament cut. Next, the round ligament with the funicular artery is tied, clamped, and the first incision extended down towards the cervix in the neighborhood of the uterine artery. Then the left uterine artery is tied, clamped, and cut. An incision is carried from this point transversely over to the opposite point on the other side, but only through the peritoneum. This flap containing the bladder is separated with closed blunt scissors from the uterus. A similar smaller flap of peritoneum is separated from the posterior surface of the uterus. After that the vagina is opened just under the cervix in the left side vault, and the opening extended with scissors all around, and as soon as there is room the cervix is seized through the incision and pulled upward and over to the right. Next, the right uterine artery is tied and cut, then the right round ligament, and finally the right infundibulopelvic ligament, so that the whole uterus and its appendages are removed in one piece.

If any other artery than the six mentioned bleeds, it is provisionally seized with a clamp and tied when the uterus is out of the way.

The cut edges of the broad ligaments are brought together with a running catgut suture. When the vagina is reached, this is pulled up and included in the peritoneal suture, in order to prevent future prolapse. The opening in the vagina itself may be closed, but if it is a case of sepsis it is better to leave it open and put a drain of iodoform gauze into it from the peritoneal cavity, and I am inclined to think that even in aseptic cases it is better to drain, as the drainage replaces the natural discharge from the uterus.

If the fœtus is dead and the case septic, it is best not to open the uterus at all, but to extirpate it as we would do if we had to deal with a myomatous uterus. Finally, the abdominal wound is closed as after other laparotomies.

Total abdominal extirpation can be done and has been done during pregnancy and labor with success, but I doubt that others than the most expert, dexterous, and rapid operators will do well in adopting panhysterectomy in obstetric practice.

§ 2. **Vaginal Hysterectomy.**—Total hysterectomy may also be performed from the vagina. As a rule, we may say that this method is preferable in septic abortion cases, while in deliveries at or near term the abdominal operation is generally to be preferred.

In this respect carcinoma of the cervix forms, however, an exception. If the carcinoma is so much advanced as not to be operable, we have said above that the best is to perform supravaginal amputation and leave the carcinoma alone or to curette and cauterize the cervix and deliver the patient by Cæsarean section.

But if the cancer is operable, it has of late been recommended to deliver through the vagina and then extirpate the uterus by the same way (p. 295), and this has been done both during advanced pregnancy and during labor.

This operation is called *vaginal Cæsarean section*, and is thus described by its inventor, Dührssen, of Berlin.

Modus Operandi.—The cervix is curetted and cauterized. The parametria are circumvented. The vagina is separated from the uterus, and if necessary incised longitudinally. The cervix is severed above the carcinoma, while the uterus is being pulled down all the time. If necessary, bleeding points on the uterus are secured by circumvention. Then the anterior and posterior uterine walls are rapidly incised in the median line until the fœtus can easily be extracted. Next, the placenta is removed, and the incisions in the uterus are continued till both the anterior and the posterior cul-de-sac are opened. The ligaments may be clamped or tied from above downward. The stumps may be pulled down into the vagina and the opening in the vagina closed with sutures.

The advantage claimed for this operation is that by it the pregnant uterus can be emptied at any time during pregnancy or labor.

Schauta, who has performed the operation, says there was "horrible bleeding" in cutting the uterus. He advises, therefore, only to incise the anterior wall and pull the edges well down, which arrests hemorrhage. He advises furthermore to leave the placenta in the uterus. Its loosening takes time, and it is not in the way.

Chroback found it difficult to see the line of demarcation between the vagina and cervix. He says it is important to separate the bladder well, also laterally, and make a large opening in the peritoneum. The uterine tissue being so soft and friable, the traction-forceps are apt to tear out, especially the common bullet-forceps. The ligatures should be rather thick, in order not to cut, and while they are being tightened, traction from below must be slackened.

The child has been delivered by the high forceps or by version.

This operation is yet too new to form a definite opinion about its value, and it need hardly be added that it is only an operation for expert gynæcologists.

In cases of sepsis after abortion, the uterus may be removed through the vagina, just as any non-pregnant uterus with a fibroma or beginning cancer.[1]

---

[1] Garrigues, Diseases of Women, third ed., p. 510 et seq.

CHAPTER XVII.

EMBRYOTOMY.

Embryotomy is a general term, comprising all the operations by which the body of the fœtus is diminished in order to deliver it from the maternal body, namely, *craniotomy*, *decapitation*, *evisceration*, *brachiotomy*, and *cleidotomy*.

§ 1. **Craniotomy.**—Craniotomy, or cephalotomy, is an operation by which the size of the fetal head is diminished; and, as a rule, the fœtus is thereafter extracted.

It is one of the oldest obstetric operations, frequently resorted to by the old Greeks and Romans.

Indications.—1. *Dead Fœtus.*—If the fœtus is dead and there is an obstruction in the way of its progress, or the mother's condition makes a speedy delivery desirable; and if, on the other hand, there is no absolute indication for Cæsarean section, the fetal head should, in the interest of the mother, be diminished. Great care must, however, be taken not to make a mistake in declaring the fœtus dead. Fetal heart-sounds may temporarily be inaudible; a discharge of meconium shows only that the child is in a dangerous condition; a pulseless, prolapsed cord may belong to a twin. It is only by following the case for a longer period that the accoucheur can satisfy himself that the fœtus is dead.

2. *Living Fœtus.*—With the great advancements made in obstetrics in modern times through symphyseotomy and Cæsarean section, there is a growing indisposition to kill the child in order to save the mother, and we have seen above that the Roman Catholic Church does not allow its adherents to have this operation performed. To wait till the child dies and then mutilate it, is not only sophistry, but often leads to the death of the mother through rupture of the uterus, exhaustion, or infection. The writer is of the opinion that no chief of a public lying-in hospital should be compelled to kill a living child in its mother's uterus, as long as there is a fair chance of saving both by means of symphyseotomy or Cæsarean section. But in private practice the accoucheur will in most cases be required to do so, if thereby the mother can be saved; and especially in country practice, where the doctor comes from far away and has many other patients to attend to, he often will be forced to sacrifice the fœtus; but as far as possible this should not be done without a consultation with another practitioner.

The operation is indicated: 1. In contracted pelvis with a conjugate between 2 and 3 inches (5–7½ centimetres). 2. With too large a child. 3. With tumors, cicatrices, or other obstructions in the soft part of the genital tract, if delivery is necessary in order to save the mother from actual danger, threatening her life, and it cannot be accomplished in a conservative way. As a rule, craniotomy will not be resorted to under this indication until delivery with forceps or version has proved impossible. As to version it should, however, be remembered that the greatest danger threatening the mother is rupture of the uterus, and there may be such a distention of the lower uterine segment and the cervix that the very introduction of the hand would produce the rupture.

Conditions.—In order to follow the indication, certain conditions must be present. 1. The pelvis must be large enough to let the diminished head pass. 2. The os must be so dilated that the necessary instruments can be applied to the head without injury to the mother; and if extraction is to follow immediately, the cervix must be so dilated that this can be done safely. 3. The head must be within reach.

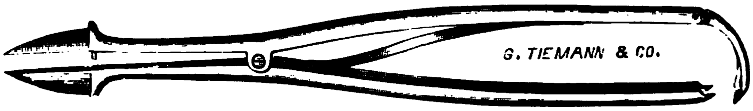
In hydrocephalus craniotomy is contraindicated. There the head is diminished by puncturing it with a trocar through a fontanelle or suture. When the serum is let out the head may collapse sufficiently for the child to be born, and craniotomy should be abstained from, as such children whose heads were merely punctured have been born alive and lived several days, which may have important legal consequences.

With after-coming head it is never necessary to use craniotomy on the living, because the child will be dead within a few minutes.

Craniotomy is a general term that includes several operations: perforation, cranioclasis, cephalotripsy, removal of the cranial vault, and basilysis.

PERFORATION.—The patient is anæsthetized and placed across the bed or on a table. The pubes are shaved off, or at least cut short, and the vagina is disinfected. The four fingers of the left hand are introduced into the vagina, so as to protect it on all sides against injury from the perforator. An assistant presses the head well down on the brim, while the operator perforates the skull. Two kinds of perforators are needed,—Naegele's scissors-shaped perforator, opening outward (Fig. 475), and Thomas's knife concealed in a screw-pointed tube. Naegele's instrument can on the head be used for perforation only at a fontanelle or a suture. It is introduced closed and pushed in to the wings.

FIG. 475.

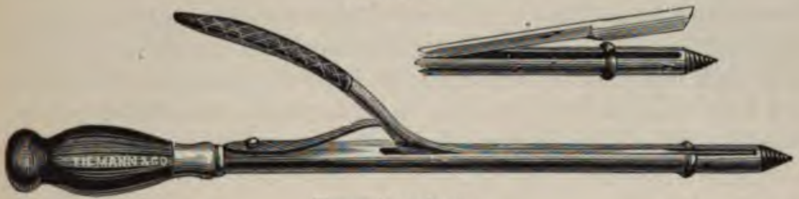


Naegele's perforator.

Then the bar at the posterior end is cast loose, and the instrument opened to its full width, cutting in both directions. Next, it is closed again and reintroduced at right angles to the first cut, and made to cut as before. This instrument is of particular value with after-coming head, when perforation is made through the vertebral column, since it can be used for cutting the skin and muscles, as well as bones and membranes.

For all other purposes Thomas's perforator is far preferable (Fig. 476). With it the operator is entirely independent of fontanelles and sutures. Whatever portion of the head is most accessible is perforated by screwing the instrument into the skull and pushing it to the protruding rim. By pressure a strong knife is made to project sidewise from the tube and cut whatever is in its way. By repeating the cutting in different directions a crucial incision is made through the skull.

FIG. 476.



Thomas's perforator.

As the head, as a rule, slides forward, the handle of the perforator should be well depressed towards the perineum and the instrument inserted behind the symphysis.

Whether we use one instrument or the other, when first the crucial incision is made, the instrument should be closed and moved in all directions inside of the cranium, so as to break up the brain. If the fœtus is alive, particular pains should be taken to destroy the medulla, which causes instant death and avoids the harrowing spectacle of the child being born mutilated and still alive.

It is not necessary to wash out the cerebral substance. I think even it is better not to do so, because in most cases the perforated head will be extracted with an obstetrical forceps, and in order that the instrument may get a grip on the head this ought not to be too small and flaccid.

If the operator prefers to turn and extract manually, it may be well to empty the skull, which can easily be done after it is broken up, by introducing a metal tube connected with a fountain syringe. Great care should be taken to cover spiculæ well with the scalp, so as to prevent them from wounding the inside of the womb.

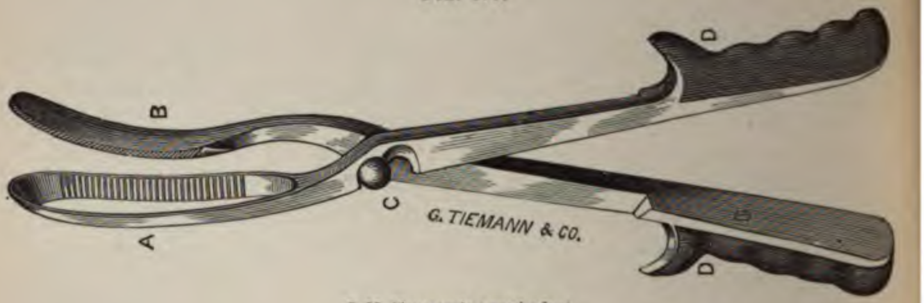
If the os is not sufficiently dilated at the time of the perforation, it is better to leave the case to nature or dilate the os artificially before extraction.

The *after-coming head* may be perforated through the occipital bone or one of the lower side fontanelles, behind the ear, through the mouth, or through the vertebral column. For this last purpose, a longitudinal incision is made in the median line of the neck or back, some arches of vertebræ are cut, and the perforator is pushed through the foramen magnum. When the brain is broken up it may be washed out as stated above.

As a rule, perforation is followed up by extraction. We have said that this may sometimes be done with forceps or by version, but if there is a considerable obstruction, other means will be required.

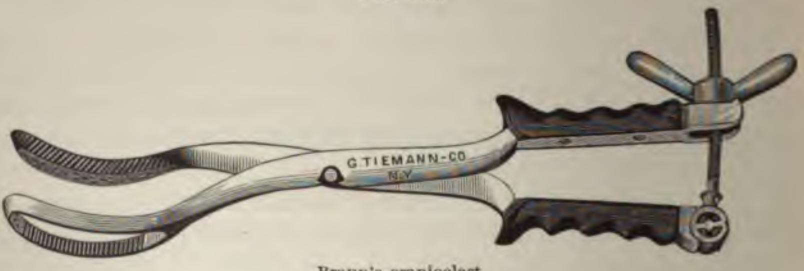
CRANIOCLASIS.—The *cranioclast* was invented by Sir J. Y. Simpson and much improved by Carl Braun. Simpson's instrument is smaller and was designed both to extract the head and to break off bones from the skull (Fig. 477). Braun has retained the principle of an internal and an external blade, but has made the instrument larger and more powerful and added a compressing screw at the handles (Fig. 478).

FIG. 477.



J. Y. Simpson's cranioclast.

FIG. 478.

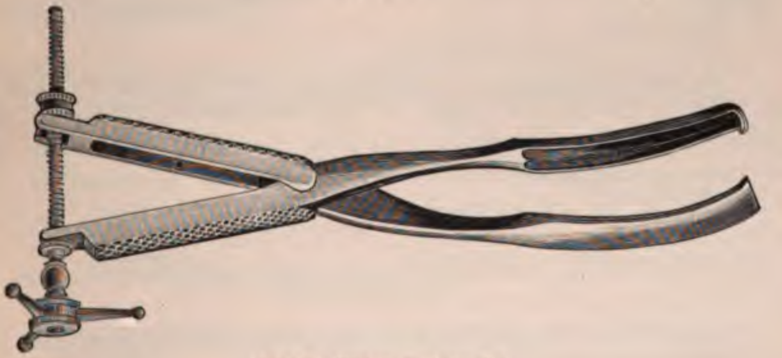


Braun's cranioclast.

Simpson's instrument is rarely used, as its name would indicate, to break up the skull, and Braun's not at all. It is a most excellent instrument of extraction after perforation. It consists of two blades, locked like those of a forceps. Both have a small curve in the same direction, so that one fits into the other; the inner is solid, the outer fenestrated, and both are serrated, so that both working together have a good grip on the intermediate bone and scalp. The solid blade is passed through the opening made with the perforator, and the fenestrated between the fetal scalp and the uterus. If the piece of bone first seized breaks off, the instrument is reapplied on another part of the cranial vault. The great value of the cranioclast as compared with the cephalotribe, which is an older instrument, is that it is easier to apply, takes less room in the pelvis, is better fit for traction, and draws the head out into a long body instead of making it protrude more in one place while diminishing it in another. The author has sometimes combined the cranioclast of Simpson with the forceps, and was well satisfied with the result.

Cephalotripsy.—The cephalotribe is a powerful, narrow-bladed forceps, with slight pelvic curvature and still less cephalic curvature. It may have solid or fenestrated blades, which are brought together with a screw. It is meant for crushing and extracting the head. One of the best instruments of this kind is that of Braxton Hicks (Fig. 479).

Fig. 479.



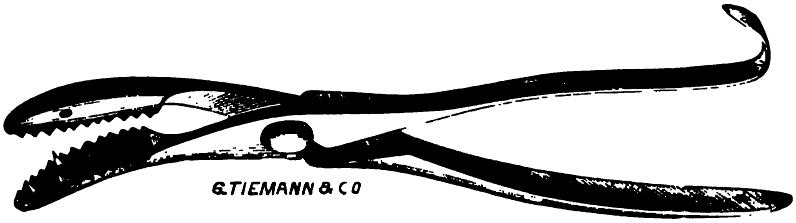
Braxton Hicks's cephalotribe.

The blades are applied on two opposite points of the head, under the guidance of the four fingers, great care being taken not to injure the cervix. The instrument is locked like a forceps and screwed together slowly, as otherwise the head might slip away from its grasp. It often is necessary to reapply it, which may be difficult when a furrow is made by the first application. It is recommended to allow labor-pains to work in the intervals, and to let an hour or even two, three, or four hours elapse before the instrument is reapplied. If the cephalotribe is used for extraction, the accoucheur should follow every rotation observed on the head. The body of the fœtus is usually so soft that when the head is extracted it does not offer any serious obstacle to delivery. If it exceptionally does, the cephalotribe may be applied to it. Since the cranioclast has become popular in Great Britain and Germany, some obstetricians are inclined to do away with the cephalotribe, which is a French instrument.

Removal of the Cranial Vault.—When the pelvis is very narrow it has been found expedient to break off piecemeal the whole bony vault of the cranium. This is done with instruments called *craniotomy-forceps*,—for instance, that of Thomas (Fig. 480).

They are strong bone-forceps, which are introduced with one jaw inside of the bone and the other between the bone and the scalp. By a sudden wrench of the wrist, as large a piece as possible is broken off, great care being taken to prevent it from wounding the soft parts of the genital canal. In this way the whole vault of the cranium may be removed, and it is then recommended to turn the face downward, which probably will be feasible by means of the cranioclast or the craniotomy-forceps. The distance from the orbit to the chin of the fœtus is only about one inch. If then there is a space of 3 inches (7½ centimetres) from side to side, the remainder of the head may be pulled out.

Fig. 480.



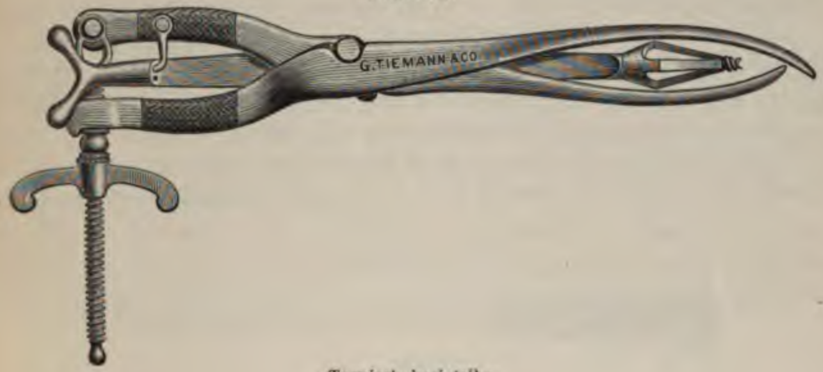
Thomas's craniotomy-forceps.

Basilysis.—Perforation attacks only the cranial vault, and the cephalotribe may not succeed in crushing the much stronger bones forming the base of the cranium. Special instruments have therefore been devised for breaking this part up. In France they use Tarnier's *basiotribe* (Fig. 481).

The basiotribe consists of three parts,—1, a straight perforator with screw-point that is to pass through the vault and into the base; 2, a blade to be applied outside the head and jointed to the perforator, so as to make of it a modified cranioclast; 3, a second blade to be applied when necessary to the side of the head opposite to that which was caught by the first, so as to make of the instrument a modified cephalotribe.

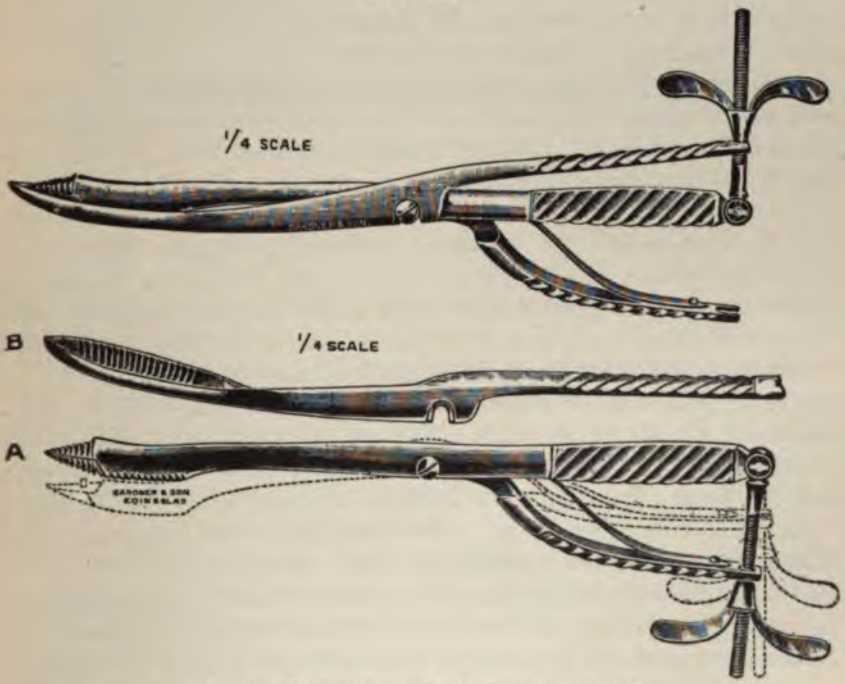
Another instrument, the *basilyst*, has been invented by Prof. A. R. Simpson, of Edinburgh (Fig. 482). It consists of, 1, a perforator with screw-point, which can be opened in two halves by means of a screw-bar; and 2, an outer solid, serrated blade, which articulates with the first, as in a cranioclast. The same screw which serves to open the inner stem, being turned the other way, presses the outer blade

FIG. 481.



Tarnier's basiotribe.

FIG. 482.



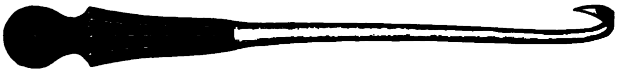
A. R. Simpson's basilyst. *A*, perforator; *B*, outer blade.

against the perforator. This would seem to be an excellent instrument. The perforator is bored through the vault and the base, which are broken up by separating the component parts of the perforator, and then the outer blade is introduced and jointed with the former, constituting a cranioclast.

All these operations may be facilitated by turning the patient on the left side and introducing a large Sims speculum, which not only allows us to see what we are doing, but also offers a perfect protection for the posterior wall of the vagina and the vulva.

THE CROTCHET is a sharp steel hook with a curved shank and a handle (Fig. 483). It used to be hooked on to the inside of the base of the cranium; but, if it loses its grip while forcible traction is being made, it is so dangerous both for patient and doctor that with good reason it has been discarded nearly everywhere.

FIG. 483.



Crochet.

Prognosis.—With our present antiseptic measures and with average skill on the part of the obstetrician, a simple perforation should have no maternal mortality. Still, at a not very remote date, Wyder[1] collected 168 miscellaneous cases, with a mortality of 14 per cent., and in the clinic of Halle and the policlinics of Berlin and Leipsic, where it is to be presumed the operation was well performed, there were 215 cases, with a mortality of 12, or 5.6 per cent. The trouble is that these cases frequently have been in the hands of ignorant midwives and inferior physicians, who delay asking for help in time, and thus expose the woman to exhaustion and infection.

The cephalotribe is a formidable instrument, which besides crushing the fœtus is apt to inflict injury on the mother. Good reports come of the results obtained with the basiotribe; and the basilyst
the great advantage over it of having only one external blade.
really only a vastly improved cranioclast, an instrument that
has driven the cephalotribe from the field.
ons by which the whole cranial vault is removed are
gerous, and hardly to be undertaken by anybody who
. Fortunately, cases demanding such a treatment
rare, and, in the writer's opinion, the prospects for
be better if Cæsarean section were performed, not
ssibility of saving the child's life.

, Archiv für Gynäk., 1887, vol. xxxii. p. 50.

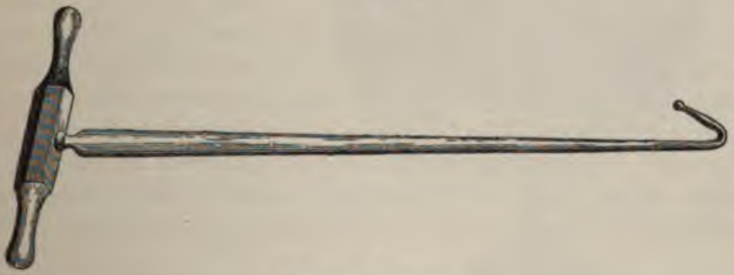
§ 2. **Decapitation.**—Decapitation is the operation by which the head of the fœtus is severed from its body, and was known to the ancient classic peoples.

It is *indicated* in transverse presentation, when version has been neglected or has proved impossible, or would be too dangerous, as it would be likely to produce rupture of the uterus.

As a rule, the arm is prolapsed and the shoulder impacted in the pelvis. By vaginal examination we feel the shoulder or part of the back, and when with difficulty we succeed in entering farther we may reach the axilla or the ribs or the shoulder-blade, so as to be able to find out how the fœtus lies.

Modus Operandi.—Decapitation is performed in the easiest and safest way by means of Braun's "Schlüsselhaken,"—*i.e.*, keyhook (Fig. 484). This consists of a steel rod bent at an acute rounded-off angle and ending in a little round knob, and a handle set at right angles to the stem.

FIG. 484.



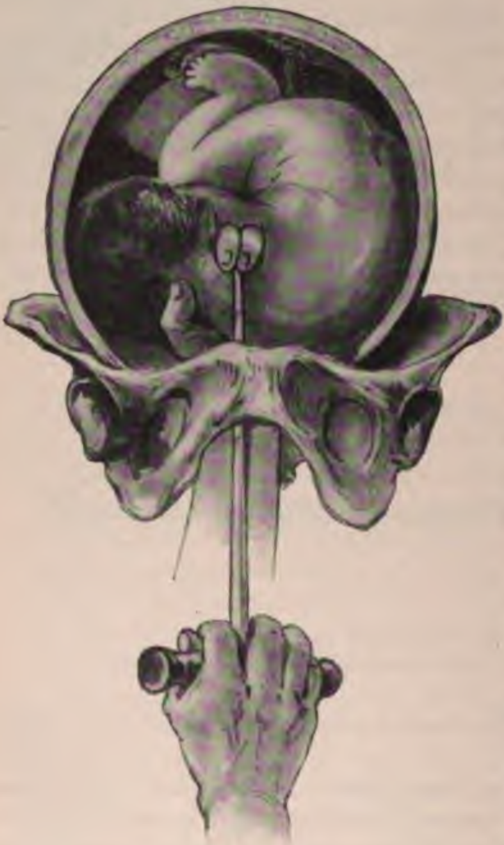
Braun's key-hook.

The patient is placed in dorsal position, anæsthetized and disinfected as usual. The accoucheur introduces his left hand into the uterus, if the head lies in the right side, seizes the neck, with the index and middle finger behind and the thumb in front (Fig. 485), and pulls it down as much as possible. Next, he introduces the hook on the flat until it has passed the neck, when he turns it around so as to make it ride over the neck. The fingers should be kept in contact with the knob of the instrument, which is pulled straight down as far as possible, and then rotated under continued traction, severing the vertebræ, which are heard cracking. The muscles and the skin are torn with the instrument or severed with scissors.

If the head lies in the left side, the right hand should be used to fasten the neck, and the instrument worked with the left hand. Otherwise the movements will be communicated to the head, which may injure the uterus.

If this instrument is not at hand, the neck may be severed with strong blunt scissors or the chain or wire of an écraseur, if it can be brought around the neck, which may be done as we have explained in speaking of impacted breech presentation (pp. 387–389). If scissors are used, the arm should be pulled well down in the direction of the body of the fœtus, so as to put the neck on the stretch.

Fig. 485.



Braun's hook applied.

When once the head is separated from the body, the latter is easily extracted by the prolapsed arm, whereas the head may be quite difficult to remove. If the arm is not prolapsed, the accoucheur should try to bring it down. If he does not succeed in this, he may try a blunt hook applied in the axilla (p. 389, Fig. 305).

The best way of removing the head is to have an assistant press it down while the accoucheur perforates it and extracts it with cranioclast or, if that instrument is not available, with the cephalotribe or the obstetric forceps. Great care should be taken to turn the stump of the neck in such a way that it does not wound the soft tissues of the mother.

§ 3. **Evisceration.**—*Evisceration*, or *exenteration*, is an operation by which the contents of the thorax and abdomen of the fœtus are removed in order to make it small enough to be born. This operation is indicated in cases similar to those in which decapitation is used, if the neck is not within reach.

A perforator, strong blunt scissors, craniotomy-forceps, and traction-forceps are the instruments needed. A crotchet may also be used to advantage. Protected by the left hand or, better, by means of a large Sims speculum, the axilla or back of the fœtus is perforated, and through the opening thus formed the heart and lungs are cut loose and drawn out. If this does not yet suffice, the diaphragm is attacked and an attempt made to get the large liver out, but this will probably be easier by making another opening in the abdomen. When the fœtus is sufficiently diminished it is seized by the feet and turned. If this is not possible, the vertebral column and the soft tissues are cut with strong scissors and each half of the fœtus is extracted separately (*spondylotomy*).

§ 4. **Brachiotomy.**—Brachiotomy is an operation by which the arm is exarticulated. As we have seen above, the prolapsed arm may be very useful in performing embryotomy, and the accoucheur should therefore take good care not to cut it off, by which he would not gain any space and might make the other manipulations indicated more difficult. In exceedingly rare cases it may be an advantage to exarticulate the non-prolapsed arms, which is then done with strong scissors.

§ 5. **Cleidotomy.**—We have seen (p. 193) that even in normal labor the delivery of the shoulders may offer some difficulty and call for the accoucheur's interference. If the shoulders are arrested above the pelvic brim, it is because they are too wide, and particularly because they occupy the anteroposterior diameter. The accoucheur should then introduce four fingers and push on the anterior shoulder, trying to place the shoulders in the transverse diameter of the brim.

The too great width of the shoulders is frequently found in hemicephali (Fig. 319, p. 402). With a normal head it may become the cause of death of the fœtus after the head is born. If the manœuvres recommended to help the shoulders down and out do not succeed, and the fœtus dies, and the mother is in good condition, we may wait and see the effect of labor-pains, by which the shoulders may be turned into the transverse diameter and descend. But if this does not take place, and a speedy delivery is called for, especially if the patient is feverish or the uterus threatens to rupture, an operation called *cleidotomy* may be performed, by which the collar-bones and perhaps also the upper ribs are broken. It may be done with scissors or the perforator. When the collar-bones are cut, the shoulders move nearer to the sternum, and the child can be born.

PART IV.—ABNORMAL PUERPERY.

CHAPTER I.

PUERPERAL INFECTION.

§ 1. **Nature of the Disease.**—By puerperal infection is here understood all the manifold inflammatory conditions in puerperal women caused by microbes or their products, except eruptive fevers and inflammation of the breasts.[1]

Some authors take the term *puerperal infection* in a narrower sense, using it only to designate conditions in which an invasion of microbes takes place into the tissues; while they call the absorption of the poisonous fluid produced by the microbes, the so-called *toxins*, from the surface into the tissue, *intoxication*. It is claimed that intoxication is less dangerous. But this appears too theoretical to the writer. Since the absorbed toxins may cause disease and death, and since in treating a sick puerpera we do not know what ultimately the pathologist and bacteriologist will find in her dead body, I retain the definition I have followed in earlier writings on the subject.

In most books the condition is called *puerperal fever*, a denomination from which the writer entirely abstains. Not many years ago this expression was used to designate what was believed to be a disease *sui generis*, and it has left so unsavory a record that it fills the laity with terror. In most countries there are special laws concerning it. As it is looked upon as a most dangerous contagious disease, midwives are ordered to report it to the medical inspector of the district in which they practise, and are, as a rule, forbidden for a time after a case of this nature has occurred in their practice to attend to other confinements. But it is impossible to define "puerperal fever" in this sense of the word. Modern German authors use the term for every rise in temperature in childbed, which perhaps is due to retention of fæces or an emotion, and has no connection with microbes. There is so much more objection to the term "puerperal fever" as in some of the worst cases there is no fever at all.

---

[1] Garrigues, "Dissecting Metritis," N. Y. Med. Jour., 1882, vol. xxxvi. p. 587; "Dissecting Metritis," Archives of Medicine, April, 1883; "Dissecting Metritis," Med. Record, 1883, vol. xxiv. p. 664; "Prevention of Puerperal Infection," ibid., December 29, 1883, vol. xxiv. pp. 703–706; "Prevention of Puerperal Infection," N. Y. Med. Jour., 1884, vol. xxxix. p. 243; "The Opium Plan in Puerperal Fever," ibid., 1885, vol. xli. p. 98; "Puerperal Diphtheria," Trans. Amer. Gynæcol. Soc., 1885, vol. x.; Practical Guide in Antiseptic Midwifery, Detroit, Michigan, Geo. S. Davis, 1886; "Puerperal Infection," in American System of Obstetrics, edited by Hirst, Philadelphia, 1889, Lea Bros., vol. ii. pp. 291, 400; "Ueber Metritis Dissecans," Archiv für Gynäk., 1892, vol. xxxviii., No. 3; "Reprehensible, Debatable, and Necessary Antiseptic Midwifery," Med. News, November 26, 1892; "Puerperal Infection," in American Text-Book of Obstetrics, edited by R. C. Norris, Philadelphia, Saunders & Co., 1895, pp. 683–734; "The Present Status of the Treatment of Puerperal Infection," St. Louis Courier of Medicine, January, 1901.

Some use the term "puerperal *septicæmia*," which is so far an improvement as it reminds one of the identity of puerperal infection and wound infection; but the expression leads to constant confusion. It is too wide because the same word is used to designate particular forms of puerperal infection, and forms which are rather distinct from one another. Thus, some use "septicæmia" in the sense of lymphangioperitonitis, as opposed to uterophlebitis, which they call *pyæmia*. And all use it to designate a condition in which septic material circulates with the blood-current throughout the body, which etymologically is the meaning of the word. But there are in puerperæ many inflammatory conditions which certainly are due to puerperal infection and still hardly ever lead to a general infection of the whole system.

The term "puerperal infection" is open to the criticism that it means a cause, and not the effect produced by it; but this is not without analogy. The word "cold," for instance, means originally a low degree of temperature, but by extension it is also used to designate the disturbance caused in the human body by exposure.

By using the term "puerperal infection" we have the advantage of having a general expression that covers all cases, mild and severe, all disturbances, local and general, in the equilibrium of health. We are forcibly reminded of the nature of the disease and the possibility in nearly all cases of warding it off, whereas the preceding generation attributed it to some unknown and unconquerable change in the atmosphere or looked upon it as a direct dispensation of God, to whose will mankind reverently had to bow and submit. We are turned in the right direction to find means of relief and cure when the disease has developed. We stand also on solid scientific ground, for, as we presently shall see, the mildest and the severest cases of morbidity are usually caused by the same microbes.

Puerperal infection nearly always is due to infection of wounds in the genital tract. We know that a clean wound, kept clean, heals and does not cause general disease. When suppuration, diphtheria, gangrene, or erysipelas sets in, it is due to the presence of microbes, and so it is with puerperal infection.

Wounds.—The whole inside of the body of the womb is one large wound, the separation between the ovum and the uterus taking place in the areolar tissue of the decidua, and at the placental site there are numerous veins, either with freshly agglutinated walls or plugged by thrombi. In this respect the human economy is exposed to much greater danger than that of animals: with them, as a rule, the process of expelling their offspring is not more difficult than the act of defecation. The placental site in their womb either regains its epithelium before the loosening of the placenta or recovers it in a very short time, sometimes even in a few minutes. This explains why puerperal infection is not produced in them by injection of toxines into the vagina and uterus, while the same fluid injected into the tissues under the protecting epithelium causes the disease.

The cervix is nearly always more or less torn near the os in consequence of the forced expansion during the passage of the fœtus, and sometimes these tears extend deep into the parametrium. At the entrance to the vagina there are nearly always some tears, at least in primiparæ. The perineum also frequently is more or less lacerated. Finally, there are numerous abrasions in the cervical canal, the vagina, and the vulva. It will thus be seen that there are many wounded surfaces through which infection may occur.

Microbes.—The obstetrician has to look to the bacteriologist for information in regard to the organisms that cause puerperal infection. A few years ago these scientists spoke with great assertion, and everything seemed to be clear and easy; but accumulating experience has made them more diffident, and the outsider sees many discrepancies in the results they arrive at. In 1899 the German Gynæcological Society had chosen "puerperal fever" as a special subject of discussion. Some of the greatest obstetricians and bacteriologists of Germany were present, and the world would be inclined to expect special light from such an assemblage of men on such a subject in a country where probably greater attention is paid to bacteriology than anywhere else. One is, therefore, rather disappointed to find how far they are from unanimity, either in the results of their bacteriological investigation or in the practical methods of treatment based thereon. Even such a fundamental fact as the presence or absence of fever-producing microbes in the vagina of pregnant and parturient women seems still to be doubtful. Kroenig,[1] who used to be the banner-carrier of those who denied their presence in health, has changed his mind in this respect. (Compare p. 125.)

All agree that there are no microbes in the uterus before delivery, but Burkardt[2] has examined the interior of the womb of healthy women during the puerperium. During the first five days, and sometimes as much as eight, no germs were found. After the eleventh day they abound, and there are even plenty of streptococci,

[1] The bibliographic references are found at the end of the chapter, p. 746.

which are declared by all to be the most common and most dangerous cause of puerperal infection. But since the patients all remained well, except for a slight rise in temperature, Burkardt thinks there must be two kinds, the highly dangerous streptococcus pyogenes and an innocuous streptococcus saprogenes, but so far there is no means of distinguishing them from each other.

Koblanck[3] found streptococci in the vagina of nineteen puerperæ, of whom thirteen were perfectly well, and six had only a slight rise in temperature. The theory has, therefore, been advanced that the slight fever frequently observed in puerperal women is due to a secondary infection, the parturient canal being a wound that easily can become infected from the skin, with which it is continuous.

There is, however, no doubt that puerperal infection is due to microbes. The most important of these is the *streptococcus pyogenes*, a microscopic plant that is found nearly everywhere, and which, therefore, can easily be brought into the genital tract by physicians and midwives, even if it is not found there before. These streptococci can also wander spontaneously into the genitals, and are even found in new-born children.[4] Many observers state that the streptococci found in patients suffering from puerperal infection are identical with the streptococcus of erysipelas and of suppuration.

Next to streptococci the most important microbes in puerperal infection are *staphylococcus aureus* and *staphylococcus pyogenes albus*. Of these the latter is always found on the skin of man and in the secretion of the vagina, and the former only a little less frequently.

Very serious illness and death may also be due to *bacterium coli commune*, a normal inmate of the bowel, or to *gonococcus* or *pneumococcus*, organisms that are exceedingly common. These three are often found in company with streptococcus, but they have also been found to cause the most severe inflammation alone. The *bacillus diphtheriæ* of Klebs-Löffler has also been found as cause of infection of the genitals of the diphtheritic type and combined with the usual throat affection.

Different Forms of Infection.—The infection may be *local* or *general*, the first of which is limited to a comparatively small area, while the second implicates the whole system, and, therefore, is much more dangerous than the former. We must also distinguish between *putrid* infection and *septic* infection, both of which may be local or general. General putrid infection is called *sapræmia*, and general septic infection *septicæmia*. It will be noticed that the word septicæmia here is taken in an entirely different sense from that in which it is made to designate lymphangioperitonitis only.

Putrefaction and sapræmia are due to many different schizomycetes, the so-called *saprophytes*, minute organisms which are allied to algæ, and are found all over the world in streams, plants, animals, etc. They are anaerobic,—that is to say, they cannot thrive in a medium containing free oxygen. They get the oxygen needed for their sustenance by butyric, alcoholic, or other fermentation which they incite. By their growth and multiplication these organisms produce certain chemical substances, the so-called *toxines*, a kind of ptomaines which give rise to fever. *Ptomaines* are alkaloids produced in dead vegetable and animal tissues. They are produced only by microbes, and are generally poisonous. *Leucomaines* are similar alkaloids produced in living animal tissues as a result of their physiological activity, and are harmless, unless their excretion is interfered with.

The changes occurring in puerperal infection may be due to the absorption of ptomaines and leucomaines alone, without the presence of microbes, but in the vast majority of cases the microbes are present. The saprophytes are generally brought into the interior of the uterus mechanically.

Septicœmia is due to a few well-known species of microbes that actively enter the tissues of the body, which they injure through their growth, and by their distribution throughout the economy they may so change the chemical processes and normal functions of the organs that death ensues. These microbes are, as stated above, chiefly streptococci, and next to them staphylococci, but occasionally also bacterium coli commune, the gonococcus, the pneumococcus, the bacillus of diphtheria, the bacillus aërogenes capsulatus of Welch and Nuttall, and the bacillus of malignant œdema of Fränkel are the agents at work in puerperal infection. These are called *pathogenic* microbes, which means causing disease, in contradistinction to other microbes called *non-pathogenic*, which only cause putrefaction. At first streptococcus pyogenes, staphylococcus aureus, and staphylococcus pyogenes albus were thought to be the only pathogenic microbes; but with increasing experience the list has become considerably longer, and the whole distinction does not seem to be of much value. The same species may be pathogenic and non-pathogenic.

The infection, in the majority of cases, starts from the endometrium, and, according to what has just been said, a *putrid endometritis* has been distinguished from a *septic endometritis*. In putrid endometritis there is a superficial layer of necrotic tissue, and under that a thick layer of granulation tissue full of leucocytes, or phagocytes, which may engulf the microbes and render them innocuous. The necrobiotic layer is covered with saprophytic cocci and bacilli, but they never enter the granulation layer.

Septic endometritis is either *local* or *general*. In the *local* form the inside of the uterus is much like that of the putrid, but in addition to saprophytes streptococci are found.

General septic endometritis appears under two distinct and very different forms, the lymphatic and the thrombophlebitic. In the *lymphatic form* there is a mixture of saprophytes and streptococci on the endometrium, but the layer of granulation tissue is much thinner than in the putrid endometritis, and in the most severe cases it is altogether absent. The veins of the placental site are closed by agglutination, and there are no thrombi. In the severest cases the microbes enter the fine lymph-spaces between the tissue elements; in the less rapid they generally follow the trunks of the large lymphatic vessels. From the lymph-vessels they enter the surrounding tissue, causing necrosis. This lymphatic form often starts from the cervix. In septic peritonitis the infection-carriers do not go through the Fallopian tubes, but through the lymph-spaces and lymph-vessels of the uterine wall.

In the *thrombophlebitic form* of general infection the endometrium is like that of the local form, except at the placental site. Saprophytes and streptococci are found together on the surface, but they never penetrate the tissues, except at the placental site. Here the veins are plugged with thrombi, into which saprophytes and streptococci enter; but while the saprophytes stay near the surface, the streptococci, finding the soil particularly favorable, penetrate deeper, and soon the thrombus becomes disintegrated and forms a detritus, a process that may extend into the broad ligaments.

But the author of this distinction between putrid and septic endometritis (Bumm) himself admits that the two forms may be combined, and another bacteriologist (Krönig[5]) declares that saprophytes may penetrate the tissues and give rise to parametritis and perimetritis.

The *diphtheritic form* of puerperal infection begins in the mucous membrane of the vulva, vagina, or uterus, or in a tear extending into the surrounding tissue. Patches like those found on diphtheritic sores or in the throats of patients affected with diphtheria make their appearance. As a rule, it is the same above-mentioned streptococcus pyogenes which invades the tissues in this diphtheritic form, but the true Klebs-Löffler bacillus of diphtheria has also been found.

The difference in symptoms and danger in different cases may be accounted for in many ways. The power of resistance of the attacked individual varies much. A woman who is debilitated by previous disease, or who has lost much blood, is more likely to succumb than one in physically good condition. The number of the invaders is also important. The phagocytes may be able to devour a certain number, but when the limit is passed they are no longer equal to the task of neutralization. The anatomical structure and connections of the part invaded explain many differences in the ravages wrought by the microbes. If these enter one lymphatic, they may only be carried to the nearest lymphatic gland and made harmless there. If they enter another, they may be carried straight to the peritoneum, the pleura, and the pericardium. Or a thrombus in a uterine vein may break down and the microbes in it may be carried through the vena cava and the right half of the heart to the lungs, where they are arrested in one of the fine branches of the pulmonary artery and form an abscess, from which they may return to the left side of the heart and be distributed in all parts of the body.

The difference in virulence seems to be the most important of all. This is a property of the protoplasm that shows itself in abundant proliferation and increased power of resistance to the attacks of the cells in the invaded body. This virulence is diminished by artificial culture and increased when the microbes pass through the body of an animal. The virulence is particularly enhanced in the system of a sick person. Thus the streptococci taken from a case of puerperal infection, erysipelas, smallpox, or scarlet fever are in the highest state of virulence. Staphylococci are most dangerous when they come from a fresh abscess.

Bacterium coli commune is harmless in the bowel, and does not seem to affect tears in the perineum much, but the same organism becomes highly dangerous when it enters the uterus, the appendages, or the peritoneal cavity.

Anaërobia, which are of little importance on the surface, may enter the tissues and give rise to the worst kind of infection, especially the bacillus aërogenes capsulatus and the bacillus of malignant œdema.

In the writer's opinion "puerperal fever," as it is generally understood in the profession here, is nothing but the most severe puerperal infection. Local infection is less dangerous than general infection. Putrid infection is not so dangerous as septic infection, but *any local infection may become general, and a putrid infection may cause septicæmia and death.*

Septicæmia in Children.—Identically the same disease that appears in puerperal women through infection may develop in children. The mother of the sick child may be infected or not. Infection in the child generally enters through the navel, but it may also gain entrance through sores in the mouth or through an accidental wound. It may also come from decomposed liquor amnii which the fœtus has drawn into its lungs during labor. When the normal partition between the maternal and the fetal circulation breaks down, the microbes may even pass from the mother to the fœtus through the placenta. If not acquired before its birth, the infecting substance may be brought to the infant by doctors or nurses; it may cling to any object with which the child comes in contact, or it may float in the air which it inspires. The sources of the infection in children are the same as in puerperæ.

§ 2. **Etiology.**—Experience shows that puerperæ are more liable to disease than other women, a fact which can easily be accounted for. The causes of puerperal infection are predisposing or exciting.

Predisposing Causes.—During pregnancy the blood of the woman undergoes great changes. It increases in bulk, but is more watery. Hæmoglobin, iron, albumin, fat, and phosphorus decrease, while the fibrin is much increased. The red blood-corpuscles are reduced in number, while the colorless are more numerous than in non-pregnant women. The plethora, hyperinosis, and leucocythæmia predispose to inflammation.

The blood-vessels and lymphatics become dilated, which predisposes to the formation of thrombi. These furnish an excellent soil for the propagation of microbes, and when they break down their infecting *débris* may be carried to the lungs and give rise to the formation of new infectious foci in all parts of the body.

The nervous system is in a state of great excitement. Headache, toothache, vertigo, longings, and dislikes are common features of the pregnant state. The patient is also frequently inclined to sadness, and she is highly sensitive to unpleasant impressions. The presence of an uncongenial person may arrest labor-pains. Bad news may send her temperature up several degrees. Shame in the unmarried, dread of financial difficulties in the married, often prey on their minds and lower their power of resistance. Since every muscular contraction and all secretory functions are under the control of the nervous system, it may influence the progression, stagnation, distribution, and expulsion of the microbes.

Nervous exhaustion from pain or loss of blood lowers the patient's vitality even in normal labors; and if there is any obstruction, or the membranes rupture early, the danger of infection increases very much. When the cervical plug is expelled, and the liquor amnii has drained off, the microbes have free access to the interior of the uterus and the ovum. Preceding disease, especially diabetes or eclampsia, and a weak heart lower the power of resistance. There may also be a local loss of power of resistance when the tissues are œdematous, infiltrated with blood, or bruised.

All manipulations by which the genital tract is entered with fingers, hands, or instruments enhance the danger enormously.

The artificial detachment of the placenta, or its insertion low down in the uterus, easily leads to infection. The death of the fœtus or prolapse of the cord or limbs facilitates it.

Normally, the uterus contracts forcibly after the expulsion of the child, and the walls of the veins at the placental site are agglutinated. But if this contraction is defective, either the woman bleeds to death or the veins are closed by fibrinous clots, the ends of which jut into the uterine cavity and .offer an excellent soil for the propagation and penetration of microbes.

The separation between mother and child normally takes place in the areolar layer of the decidua, but large pieces of decidua or chorion may be torn off from the ovum and remain in the uterus, where soon they become covered with saprophytes. Still worse is the retention of a cotyledon of the placenta, which is particularly apt to happen in the cornua, near the ostium uterinum of the Fallopian tube.

The entirely normal lochial discharge is an excellent culture medium for all germs and possesses phlogogenic properties. Especially if the lochia are retained in the uterine cavity—so-called *lochiometra*—they are apt to cause fever, which disappears when the uterus is lifted up and vaginal douches are given.

During pregnancy there is a strong current from the mother to the child. After delivery this is reversed. The enlarged organs and swollen tissues have to be reduced. They undergo fatty degeneration and involution, the effete matter being carried from the genitals to the rest of the body of the puerpera.

Primiparæ are more exposed to infection than pluriparæ. The canal is narrower, the tissues are softer, and labor lasts longer.

Deliveries in a general hospital, which until quite recently were a common occurrence, are more dangerous than those in special lying-in hospitals or the patients' homes. There is much greater danger of infectious substances being carried from other patients to the puerpera. Even the accumulation of many puerperæ in an insufficient space predisposes to disease among them. Parturition should not take place in a room where there are puerperæ, the discharges from the latter being particularly dangerous to the parturient woman.

The *exciting cause* is, as we have seen above, the attack by microbes of the wounds that always are found in a puerperal woman. The microbes may have been in the genital tract before delivery, they may be brought in by obstetric manipulations, or they may wander in by themselves. The rate of progression of staphylococcus aureus was found to be 80 centimetres in 56 hours (Krönig).

Nature to some extent protects the parturient woman and puerpera against infection: the cervical plug, the blood flowing out from wounds, the gush of water when the membranes rupture, the strong uterine contractions, are all calculated to keep the enemy out, but are not always equal to the task.

Sources of the Infection.—The morbific element may come from a woman similarly affected, from suppuration, from decaying substances within or without the body, or from some zymotic disease, especially erysipelas or diphtheria, all of which we shall illustrate by examples.

Contagion.—The English physician Denman (1733–1815) was the first to point out that "puerperal fever" might be carried from one puerpera to another. In this country this view was elucidated in a masterly essay by Oliver Wendell Holmes,[6] whose work as a physician and teacher is apt to be overlooked on account of his fame as poet and author. Nowadays the contagiousness of puerperal infection is universally admitted, and the only mooted point is whether the microbes necessarily are carried by means of some solid or fluid substance from one patient to the other, or may float through the air, a point to which we presently shall return.

Suppuration. — That pus can produce "puerperal fever" was demonstrated by Semmelweis in 1847. He showed that some students who had examined an ulcerating cancer of the uterus caused "puerperal fever" and death in fourteen women.

Here in America there was a celebrated case in point, which for years baffled the ingenuity of all observers. A Dr. Rutter, of Philadelphia, had in 1843 forty-three cases of "puerperal fever" in his practice, while his colleagues had none. He bathed, shaved off his hair, and wore a wig. He stayed ten days away from the city and did not take with him to his next patient anything that he had worn or carried before. She had an easy confinement, but she died from "puerperal fever." One of the greatest authorities on midwifery in America in his time, Chas. D. Meigs, declared in his work on "Woman, her Diseases and Remedies," that "such a fatality was God's providence." In our time another construction has been put on this sad case, a contemporary of Rutter having called attention to his suffering from an obstinate mucopurulent coryza.[7] In the light of modern knowledge we can easily imagine how the poor doctor touched his nose while attending to his patients and carried streptococci and staphylococci into their genital tracts.

A French physician, who had attended eight hundred women in childbed without accident, got a suppurative adenitis, for which he wore a drainage-tube. Within three weeks he had three cases of "puerperal fever."

During the period of great morbidity and mortality preceding the new era in Maternity Hospital, I had an assistant who almost constantly suffered from pustulous eczema of the hands.

In 1889 there was a paralytic patient in my service on Blackwell's Island who had a carbuncle on the sacrum. There were two other puerperæ in the same room, and all were under the care of the same nurse. The paralytic patient had no puerperal disease whatsoever, but one of the other women, who had been perfectly well up to the eighth day after her confinement, got a chill, followed by high temperature, and on examination there was found diphtheritic infiltration of the cervix.

Putrefaction.—Semmelweis proved conclusively that the enormous mortality prevalent in the Vienna Lying-in Hospital was due to the students coming from the dissecting-room to the wards in which pregnant women were examined and delivered. In the service attended by medical students mortality was three times as high as in the department in which midwife pupils were instructed.

A similar case is known from private practice. A Scotch physician, Dr. Renton, and a friend of his practised in the same small place. During a so-called "epidemic of puerperal fever," all Renton's patients remained healthy, while every one of his friend's were taken sick. The explanation was that the former did not perform any autopsies, while the other doctor did.[9]

The infection may originate also from a decomposing part of a living body. Thus it is often due to retained remnants of membranes or placenta. The writer once had a very conclusive case in his service in Maternity Hospital. Two women were confined in the same room by two different assistants. One gave birth to a macerated fœtus and the decomposed placenta had to be manually removed. When the doctor was through he disinfected himself with bichloride of mercury and examined the other patient. The first woman remained entirely healthy, but the second developed one of the worst cases of puerperal infection which the writer has ever seen. Doubtless the doctor, in spite of his disinfection, brought most virulent streptococci and staphylococci from the putrid placenta of one of the women into the genital tract of the other.

Some years before my connection with Maternity Hospital a new building had been erected on Blackwell's Island for the use of the maternity service. It had scarcely been opened before a so-called "epidemic of puerperal fever" broke out and led to the abandonment of the building. The cause of this was probably the manure with which the building had been surrounded in order to make a garden.

Fehling[10] observed an epidemic of "puerperal fever," diphtheria, and erysipelas, in consequence of a bursted waste-pipe, the dirty water soaking into the ground on which stood the hospital.

Gustav Braun[11] in 1889 had such an "epidemic of puerperal fever" in Vienna, that during a month nearly eighteen per cent. of the puerperæ were taken sick and nearly nine per cent. died. The distinguished obstetrician attributed the infection to the fecal matter from the hospital and neighboring barracks being emptied into a canal that flowed past the hospital.

The immediate contiguity of a cemetery, a slaughter-house, a cesspool, a privy, a dunghill, a sewer, a pool of stagnant water, or a stable or similar places where organic substances are undergoing decomposition is, therefore, dangerous to a parturient woman.

Zymotic Diseases.—Since the streptococcus of erysipelas is identical with that of puerperal infection, there can be no doubt that infectious material brought from a patient suffering from erysipelas to a puerpera can cause puerperal infection in her.

The same applies to diphtheria. An infiltration with a yellowish mass that cannot be wiped off, entirely like what is called a diphtheritic condition when it occurs in wounds after surgical operations, is a common occurrence in puerperal infection. In at least one case the specific Klebs-Löffler bacillus diphtheriæ was found, and the patient developed the usual throat symptoms. The writer has also seen the characteristic throat affection follow the diphtheritic condition of the genitals. A well-known obstetrician was, during an epidemic of puerperal diphtheria in the hospital with which he is connected, attacked by diphtheritic ophthalmia, with the formation of a thick diphtheritic membrane on the conjunctiva, a perforating ulcer of the cornea, and the loss of sight in the affected eye. His head nurse was at the same time attacked by the same disease, resulting in the same condition. Dr. Pallen reported the case of simultaneous occurrence of throat diphtheria in a two-weeks-old baby and puerperal diphtheria in the genitals of the mother. Both died.

Scarlet fever may attack a puerpera, but it remains scarlet fever and follows a course similar to that in other patients. Typhoid fever is characterized by the intestinal ulcers and a specific bacillus, and is clinically so different from puerperal infection that the two must be different morbid entities.

Ways by which the Infecting Agent enters the Body.—In the vast majority of cases the germs of infection are brought mechanically into the genital tract of the pregnant, the parturient, or the puerperal woman by the fingers, the hands, or the instruments of the medical attendant, be it a doctor, midwife, nurse, or friend. The microbes may lurk in one of the many lubricants commonly used, such as olive oil, lard, butter, vaseline, or cold-cream. They may adhere to a sponge, a rag, a syringe nozzle, a catheter, bedclothes, wearing apparel, or any other body coming in contact with the genitals.

Many go so far as to think that actual contact is the only way of infection, but to deny *infection through the air* is contrary to many well-established facts. Above we have mentioned cases where epidemics in hospitals were attributed to the ground, the walls of a building, the air near it being infected with fecal matter, or waste-pipe water. Now, it does not seem at all likely that the doctors and nurses brought microbes from the manure around the new Maternity on Blackwell's Island, from the fæces floating in the canal on which the Vienna Hospital was situated, or from the ground soaked by the water from the broken pipe. It is certainly much easier to suppose that the germs of disease were carried by the air into the buildings where the women were confined, and deposited on instruments, materials, clothes, or perhaps even on the hands of doctors and nurses or directly on the entrance to the genital canal.

Some years ago there was an epidemic in the New York Infant Asylum, which was traced to a dead rat found in the cellar. Now, the doctors and nurses had no business in the cellar, and the engineer never entered the wards of the hospital. The natural explanation is that the microbes developed in the putrefying body of the dead rat were carried by the air from the cellar along heating pipes and through crevices between boards to the ward above, where they infected the parturient and puerperal women directly or indirectly.

Depaul[13] reported the following striking case. A pupil-midwife, while washing the genitals of a puerpera affected with "puerperal fever," felt an unpleasant sensation. In the evening she was taken sick, and on the third day she died "with all the symptoms of the most characteristic puerperal fever." The clinical diagnosis was confirmed by the autopsy, and she was found to be a virgin and not menstruating. In this case we have then not only infection taking place through the air, but the place of entrance being far from the genital wounds in the healthy lungs. As an analogon we have in children the infection starting from the mouth.

The microbes have also been directly caught floating in the air.[14] The theory of air-infection within a limited space is also corroborated by the effects of sanitary measures. Even before the new era in Maternity Hospital the patients were always free from fever during the first week after a ward had been fumigated with sulphur. Bush[15] prevented "puerperal fever" in Berlin by heating the wards to 60° Réaumur (= 167° Fahrenheit) before using them. In many hospitals the rate of mortality was much diminished by improved ventilation. We have an analogon in tuberculosis, which is supposed most frequently to be communicated from one person to another by the sputa drying and the bacilli being inhaled.

This infection through the air is, however, limited to quite short distances. Epidemics in the old sense of the word, when the air of a city or a country was supposed to be poisoned, do not exist. As a celebrated obstetrician aptly has put it, we might as well speak of an epidemic of gunshot wounds after a battle. Epidemics are nowadays rare and circumscribed, and are always due to direct transmission from a patient or from one of the foci of infection spoken of above.

Autoinfection.—When we saw the effect of strict antiseptic preventive methods, we were inclined to throw the blame for every case of puerperal infection and death on the attending doctor or midwife.

But, later, abundant evidence has been adduced to prove that the source of infection may be found in the body of the individual herself. At one time it was thought that this was true only of saprophytes and did not apply to pathogenic microbes; but we have seen how, by advancing knowledge, the partition between pathogenic and non-pathogenic microbes has been weakened. There is no longer any doubt that *staphylococci* and *streptococci*, as well as all other microbes, may derive from the patient herself. Ahlfeld[16] has collected twenty-three fatal cases of puerperal infection in women upon whom no vaginal examination had been made. The autopsy showed that the starting-point of the disease was a remnant of the placenta, old purulent collections, or latent gonorrhœa. Another case[17] has been reported where the puerperal infection started from a purulent rhinitis, which gave rise to pneumonia and purulent meningitis, and subsequently to metrolymphangeitis. The only microbes found were *diplococcus lanceolatus* and *diplococcus pneumoniæ*.

We have already spoken of *bacterium coli commune*, which is found in every intestine and urethra, whence it may invade the genital tract and the peritoneal cavity, causing disease and death.[18]

Another most dangerous microbe, the *bacillus emphysematosus*, is constantly found in the intestine, where it is not only harmless but even useful. In the vagina it becomes the cause of emphysematous vaginitis, but when it enters the uterus it causes the ominous tympania uteri, or physometra. In general surgery it is the cause of one of the most dangerous wound diseases,—acute septic gangrene,—to which in puerperæ is found an analogon in septic emphysema.[19]

One of the pus-producing microbes, *staphylococcus pyogenes*, abounds on the human skin, whence it may wander into the genital tract. Or it may arrive there in another way. Many women have sexual connection up to the day of their confinement. The staphylococcus may consequently be deposited in the vagina before delivery, and, starting upward, cause disease.

Since a woman always has numerous saprophytes and sometimes pus-producing cocci in her vagina, these organisms may be carried thence by a perfectly disinfected finger into the uterus and cause infection.

At our present stage of knowledge it can hardly be proved that puerperal disease and death are directly attributable to the obstetrical attendant; but, of course, if many cases occur in one person's practice there is a strong presumption that he personally is the carrier of the infection, and if it can be proved that he has not used any antiseptic precautions a suit for damages may perhaps be decided against him. Otherwise he can fall back on autoinfection, and hope to establish a reasonable doubt in the minds of the jury.

Time of Infection.—Infection most commonly takes place during delivery, but it may occur also before and after labor.

§ 3. **Pathology.**—Before it was known that puerperal infection was due to microbes or their products, it was incomprehensible to the pathologists that they found such a diversity of lesions in the bodies of women who had died from what then was called "puerperal fever." In other diseases they found the same lesions in different cases, such as the different stages of pneumonia, typhoid fever, meningitis, etc.; but in those who had been affected with "puerperal fever" nearly every organ of the body might be found to present pathological changes.

ÆDŒITIS (VULVITIS) AND COLPITIS (VAGINITIS).[1]—The external genitals may be the seat of a *catarrhal* or a *diphtheritic inflammation.* In the catarrhal form the mucous membrane of the vulva and the vagina is swollen, red, and secretes a mucopurulent fluid with an offensive odor. In the diphtheritic form small white or yellowish false membranes appear, spread, and coalesce until a more or less large, thick patch is formed that adheres intimately to the subjacent tissue, which is swollen, infiltrated with serum, and of a dirty greenish or brown color.

ENDOMETRITIS is the most common puerperal affection. In catarrhal endometritis the endometrium is red, swollen, covered with a purulent fluid, and sometimes studded with small pustules. The other forms are merged in metritis.

METRITIS may assume four different forms, the *simple*, the *diphtheritic*, the *dissecting*, and the *putrescent.*

In *simple metritis* the uterus is enlarged. The wall is swollen, soft, friable, near the surface almost diffluent, cherry-colored, and bathed in a dirty greenish-brown fluid. Abscesses may form in the muscular tissue, the pus of which may become inspissated or evacuated by rupture of the wall. In the cervix are often found bruises and tears.

Diphtheritic metritis shows the tissue in a condition similar to that described under vulvitis and colpitis. It begins, as a rule, at the cervix. The writer has, however, seen it begin also at the inner opening of the Fallopian tube and form a yellow, gelatinous layer, extending to the peritoneum.

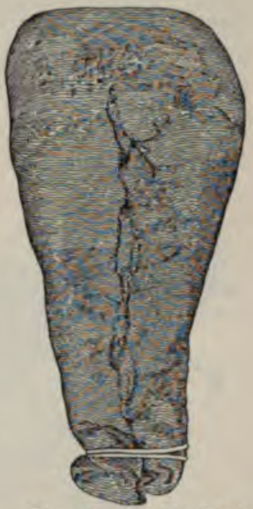
Dissecting metritis is a form that has been little noticed. The writer was the first to show its connection with puerperal infection and gave it its name. He has personally had eight cases, all examined microscopically, demonstrated in medical societies, and the diagnosis corroborated by other examiners. In this form a large piece of the muscular wall is gouged out (Fig. 486).

---

[1] The words *αἰδοῖον*, vulva, and *αἰδοῖτις*, inflammation of the same, have kindly been given me by Dr. Achilles Rose. *Κολπῖτις* comes from *κόλπος*, gulf, the Greek name for the vagina.

In *putrescent metritis* the uterus is large, but the walls are so thin that they show impressions of the intestines. The discolored mucous membrane hangs in shreds or is easily moved to and fro on the underlying tissue. The submucous tissue may be changed into a whitish substance, and the muscular may be red and flabby; but sometimes the destruction extends deep into the muscular tissue, forming cavities filled with a chocolate-colored or black pulp, due to acute septic gangrene, or with a thinner, ichorous or purulent fluid. It is particularly the placental site that shows this deep burrowing, the destructive microbes finding a favorable soil in the thrombi which fill the veins. In other cases they may follow the lymphatics.

FIG. 486.



Dissecting metritis. Specimen expelled on the twenty-sixth day after childbirth, consisting of muscular tissue folded together so as to take the shape of the uterine cavity. Length folded, 3 inches (8 centimetres).

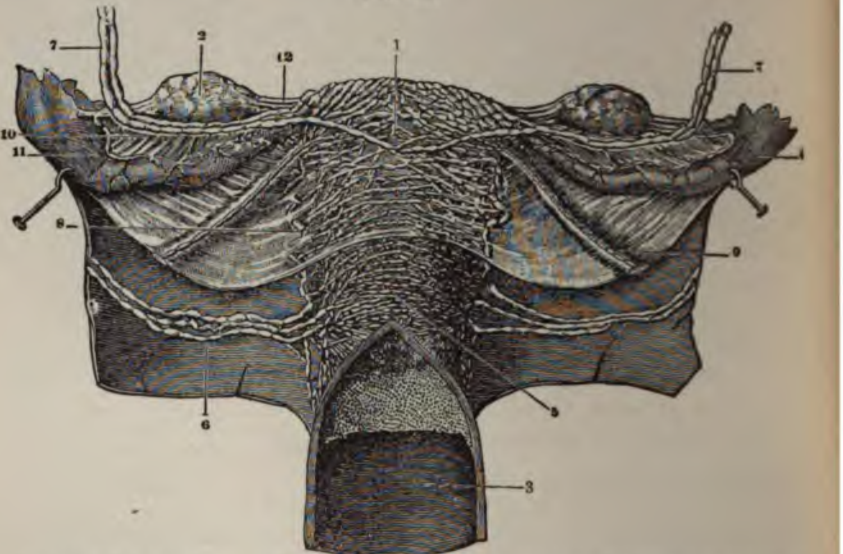
SALPINGITIS.—The Fallopian tubes are more rarely the way the inflammation follows, but we may find either catarrhal or purulent salpingitis.

OÖPHORITIS.—The ovaries, on the contrary, are frequently inflamed. It may be a superficial inflammation, so-called *perioöphoritis*, or one in the interior, *parenchymatous oöphoritis*. This may end in the formation of an *abscess* or a cavity filled with a brownish ichorous pulp —*putrescentia ovarii.*

CELLULITIS.—The connective tissue of the pelvis and abdominal wall may be swollen, infiltrated with serum, full of small round cells, and be the seat of hemorrhagic thrombi. The inflammation may end in resolution or in suppuration. In the latter case the abscess may open into one of the hollow organs,—the bladder, the vagina, or the rectum; or it may break through the skin, especially above Poupart's ligament, or in Petit's triangle, above the crest of the ilium. The inflammation may even extend above the diaphragm, enter the posterior mediastinum, and implicate the lungs as interstitial pneumonia. Or it may extend down the leg, causing phlegmasia alba dolens. In rare cases it follows the round ligament through the inguinal canal and may produce suppurative adenitis of the inguinal glands. On account of this tendency to spreading, Virchow called it *erysipelas malignum internum*, a denomination which became particularly appropriate when later it was discovered that the microbe causing the inflammation was identical with that of cutaneous erysipelas.

LYMPHANGEITIS AND THROMBOSIS OF LYMPHATICS.—The lymphatic spaces and vessels are the chief roads by which the infection reaches the deeper parts. According to Virchow there is no lymphangeitis. The lymph-vessels become much enlarged, the lymph stagnates in them and becomes inspissated and like pus. The thrombosis does not further the infection, but is due to it, and the infection extends through other branches which have not been blocked up. The lymphatics from the vulva and the lower third of the vagina go to the superficial inguinal glands, from which others go to the deep inguinal glands, that again connect with the external iliac glands. Thus a wound on the labium majus may become the starting-point of a general peritonitis.

FIG. 487.



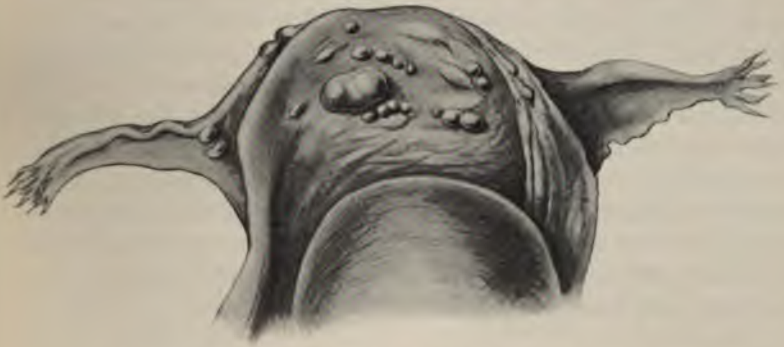
Lymphatics of the uterus. (Poirier.) 1, lymphatics from the body and fundus of the uterus; 2, ovary; 3, vagina; 4, Fallopian tube; 5, lymphatics coming from the cervix; 6, lymphatics going from the cervix to the iliac ganglia; 7, lymphatics going from the body and fundus to the lumbar ganglia; 8, anastomoses of cervical and uterine lymph-vessels; 9, small lymph-vessel running in the round ligament to the inguinal glands; 10, 11, lymphatics from the tube which empty into the large lymph-vessels from the body of the uterus; 12, ovarian ligament.

The lymphatics from the upper two-thirds of the vagina and the cervix go to the internal iliac and the sacral glands. The uterus itself is a net-work of lymph-spaces and lymph-vessels, which, finally, lead to the lumbar glands (Fig. 487).

While the lymph-vessels normally are so small that they cannot be seen until they are injected with mercury, they become as thick as goose-quills when they are thrombosed, and they may form prominences on the surface of the uterus as large as cherries and filled with a pus-like fluid (Fig. 488). From the finer lymph-vessels the infection extends to the surrounding connective tissue.

PERITONITIS.—The inflammation of the peritoneum is the most common finding in the severer cases of puerperal infection. It may be limited to the pelvis—*local*, or *pelvic*, *peritonitis*—or spread more or less over the abdomen—*diffuse peritonitis*. The inflammation may be *adhesive* or *exudative*. In the adhesive form the intestines are glued together or to other organs with a semi-solid plastic lymph. In the exudative form there is a more or less large amount of free fluid, which may be serous, fibrinous, or purulent; or it may be ichorous, brownish, and offensive. Sometimes it is much like milk, and contains large clots like curd. There may be as much as one or two quarts of it. The peritoneum is injected and in places the endothelium has been lost. The abdomen is swollen in consequence of the formation of gases in and the paralysis of the intestine. In most cases the infection starts in the endometrium and spreads through the lymphatics.

FIG. 488.



Lymphangeitis and lymphothrombosis of uterus. (Spiegelberg.)

PLEURISY AND PERICARDITIS.—From the peritoneum the microbes easily spread through the stomata of the diaphragm to the pleura and the pericardium. The membranes become red, swollen, and covered with false membranes, and the cavities in their interior contain a seropurulent fluid.

PHLEBITIS.—Less frequently than the lymphatics, the veins are the road invaded by the microbes. When the muscular tissue does not contract with normal strength, thrombi form in the veins of the placental site and sinuses in the uterine wall. As we have seen above, such thrombi furnish a favorable soil for the propagation and penetration of microbes. The thrombosis may extend into the broad ligaments and to the upper part of the thigh, where it leads to phlegmasia alba dolens.

The thrombus may become disintegrated, and detritus from it may be carried by the blood current to the heart—the condition known as *pyœmia*. In this way nearly all organs of the body may secondarily become infected. In the lungs these infarctions give rise to pneumonia and pulmonary abscesses. In the posterior part of these organs is often found hypostatic pneumonia. In the liver may be found hepatitis and abscesses. The kidneys also become inflamed and the seat of abscesses. In the more chronic cases there may be amyloid degeneration of the kidneys. The abundant adipose connective tissue surrounding the kidneys is apt to become inflamed and form a perinephritic abscess. The spleen is large and soft, and may contain infarctions, but these rarely suppurate. The mucous membrane of the intestine is swollen, but does not ulcerate. The heart is frequently the seat of pericarditis, endocarditis, which mostly is ulcerous, and myocarditis. The eyes may be destroyed by panophthalmia. The brain and its meninges are rarely inflamed, except in ulcerous endocarditis. The mammary glands, the thyroid body, the parotid, the tonsils, may all become inflamed and form abscesses. In the bladder are sometimes found ulcerations. The articulations, especially the knee, the elbow, and the shoulder, may suppurate and become ankylosed. The skin is the seat of erythematous, erysipelatous, vesicular, or pustular eruptions. The subcutaneous and intermuscular connective tissue may become inflamed, and form large abscesses and shreds of necrotic tissue.

A piece of a thrombus may be torn off, form an embolus, and cause paralysis or heart-clot. In favorable cases the thrombus may be tunnelled and circulation re-established, or it may become organized and form a permanent plug in the vein.

The disease known as *phlegmasia alba dolens* may be a phlebitis or cellulitis, or both combined. It begins always at the upper part of the thigh, and the name should not be used to designate a simple marantic thrombosis starting in the veins of the calf and the lower part of the thigh. Phlegmasia alba may be a continuation of phlebitis of the ovarian and iliac veins. Sometimes the vein is first affected by thrombosis, which leads to phlebitis and periphlebitis. In other cases the inflammation starts in the connective tissues, and the vein becomes secondarily implicated. The thrombi may undergo all the changes described above. In the phlebitic form one or more veins form strings, below which the leg is swollen.

In the cellulitic form the skin is white or pink, tense, and hard. One or both legs swell. The epidermis may be lifted by a serous exudation, forming large vesicles. The inguinal glands swell. The connective tissue may become necrotic and bathed in pus, but this pernicious form is rare.

ACUTEST SEPTICÆMIA.—In the worst cases of puerperal infection all these inflammations hardly have time to form, before the patient succumbs to the violence of the attack. Still, there are traces of lymphatic thrombosis, phlebitis of the uterus, and swelling of the connective tissue. The liver, spleen, and kidneys are large, soft, friable, and their cells show cloudy swelling. There is a little reddish fluid in the different cavities. Sometimes gas is formed, especially in the liver—*foaming liver*—and in the uterus—*tympania uteri*. This gas production is generally due to the bacillus aërogenes capsulatus. The blood is dark, thin, and has lost most of its coagulability.

§ 4. **Symptoms, Diagnosis, and Prognosis.** — In particularly well-conducted institutions bacteriological examinations are made daily during the puerperium, and thus it may be known what kind of infection is present, and a prognosis founded thereon. But most physicians have to go by the clinical features of the case. Three points are of great importance in this respect—the time of the beginning of the disease, the fever, and the mental condition of the patient. If the infection begins early, perhaps within a few hours, if the temperature rises much, the pulse becomes rapid, and the patient becomes delirious or somnolent, the case is serious. But even under favorable circumstances the prognosis should always be guarded, for an infection caused by saprophytes, or a condition that is not infectious at all, as a marantic thrombosis of a vein in the calf, may, exceptionally, end in serious infection and death.

Some groups of cases are so well marked by characteristic symptoms that they are easily described and easily recognized. Thus, there is a group of *localized infections* in which the disease remains limited to the genital tract and hardly affects the general condition of the patient. In such a case the prognosis is favorable. Then there is a *lymphatic form*, in which the disease begins early and spreads rapidly to the serous membranes—the peritoneum, the pleura, and the pericardium. This is very grave. Next, there is a *phlebitic form*, which begins later, progresses more slowly than the lymphatic, is accompanied by repeated chills, and causes metastases in remote organs. Here also the prognosis is at least serious. Finally, there are cases of acutest septicæmia in which the patient dies before localizations are developed.

But the cases cannot all be pressed into these groups; sometimes two such groups, as the lymphatic and phlebitic, are combined; and often one passes into the other. The writer prefers, therefore, to maintain the division based on the organs invaded, and to add remarks on diagnosis and prognosis as he progresses from one organ to the other.

ÆDŒITIS AND COLPITIS.—In the *catarrhal form* micturition causes smarting.

In the *ulcerative form* there is a little fever, and often the lochia become fetid. The labia are swollen, red, and sensitive. Micturition is painful and sometimes there is retention of urine. The ulcers are slow to heal, three weeks elapsing, perhaps, before recovery.

The *diphtheritic form* is much more serious. It begins often with a chill, and the temperature may reach 107° F. This fever begins generally from two to four days after delivery. It has no typical temperature-curve, except that there usually is a rise towards evening. The pulse is rapid and weak and the respiration accelerated. The patient has no appetite. The tongue is coated, the bowels are often loose, and the woman frequently suffers from nausea and vomiting.

As a rule, the uterus is implicated. It becomes large and tender, and the lochia become scanty, grayish, and offensive. The secretion of milk either does not become established or it ceases. The patient complains of pains in the hypogastric region, sometimes extending down the legs. She has severe headache, and soon she becomes stupid and delirious. These signs of a general affection may precede the appearance of the patches. For several days new patches are formed, and the old ulcers spread. From the time the infiltration ceases until the scabs formed by the treatment fall off and the sores heal, about a week elapses.

Erythema or erysipelas may start from the swollen labia and extend more or less over the body. Sometimes the vulva or vagina becomes gangrenous. The cicatrices which follow the ulcers may cause considerable narrowing and shortening of the vagina.

Diagnosis.—With a little care diphtheritic sores are easily distinguished from pus-covered tears. In the former there is an adherent yellow infiltration; in the latter the pus is easily wiped off. Plain tears, when properly attended to, cause neither local nor general disturbance. The diphtheritic sores spread with a scalloped outline.

Prognosis.—In the catarrhal and plain ulcerative form of ædœitis and colpitis the prognosis is good; in the diphtheritic form there is a considerable mortality.

ENDOMETRITIS AND METRITIS.—Simple *endometritis* and *metritis* often begin with a chilly sensation and are accompanied by moderate fever. The patient has some pain in the hypogastric region and severe afterpains, no appetite, and a coated tongue. The lochial discharge is mostly fetid, continues red longer than usual, or becomes red again after having been yellow. The uterus is enlarged and tender on pressure. As to the *diphtheritic* form, its symptoms are the same as those of diphtheritic ædœitis and colpitis. The diagnosis of streptococcic endometritis is based on bacteriology. If it is known that parts of the placenta or membranes have been retained, the presence of streptococci is likely. A fetid discharge is not characteristic. It nay be absent with dangerous infection, and it may only be due to aprophytes in the uterus or the vagina. In this respect the French lliteration "Ce qui pue ne tue pas" (What stinks does not kill) has ome foundation. *Dissecting metritis* is characterized by a protracted urulent discharge. The *putrescent* form gives the symptoms of the everest diphtheritic cases, and is accompanied by a particularly ffensive discharge.

Prognosis.—In benign endometritis and simple metritis the progosis is good. The disease lasts a week or two. The diphtheritic rm often ends in death. The dissecting form has a better prognosis. f the writer's eight cases only one died, and in that death was due o rupture of the uterus brought on by an error in washing out the terus. Of all fourteen cases known, three ended fatally. The purescent form is nearly always fatal.

Salpingitis and Oöphoritis.—The inflammation of the tubes and varies is only found combined with endometritis or peritonitis, and he symptoms become merged in those of these affections.

Parametritis (Cellulitis of the Pelvis).—The inflammation of the onnective tissue of the parametrium and the broad ligaments begins enerally on the fourth day, if labor has been normal. If, on the ther hand, it has been protracted or feverish, the parametritis may egin as early as the second day. It rarely begins as late as the ighth day or still later, and then generally after some interference with the endometrium or the cervix. This is technically called *late nfection.* It begins with a chill or chilly sensation, anorexia, thirst, weakness, sensation of heat, and a bruised feeling in the limbs. The emperature rises. Pulse and respiration become more frequent. The patient complains of pain at the side of the uterus, and on binanual examination we find the vault of the vagina tender and a swelling extending from it in the direction of the iliac fossa. When he swelling increases it pushes the uterus over to the opposite side. As a rule, only one side is affected. The uterus is hardly movable. Severe neuralgic pain may shoot down the legs or up to the lumbar egion, which may be due to pressure on the nerves or their particiation in the inflammatory process. If the inflammation extends to he iliac fossa, the corresponding extremity is drawn up and adducted, so that the knee lies on the other leg. The extremity swells. Someimes thrombi may be felt in the veins of Scarpa's triangle, the popiteal space, or the calf.

Generally, the inflammation of the connective tissue ends in resoution, but it may end also in suppuration. If the fever lasts over hree weeks, it is probably due to suppuration. Sometimes there is a ree interval of a week or two, and then fever begins again. The atient has repeated chills, mostly in the afternoon, while there is a remission in the morning. The pulse becomes smaller and more rapid. The woman loses her appetite. The swelling becomes softer and more sensitive, and finally fluctuation may be felt. The abscess may open into the bladder, when pus will be evacuated with the urine. Or it may open into the rectum, when it can be seen in the stools and is accompanied by diarrhœa. Or it may break into the vagina. In these cases the fever ceases and the opening usually closes. The abscess may also extend to more remote parts and break over Poupart's ligament, over the middle of the crest of the ilium, or on the back. Very rarely it ruptures into the peritoneal cavity and causes then acute peritonitis and death.

Diagnosis.—It may be difficult to decide whether an inflammation starts in the connective tissue or in the peritoneal cavity. Parametritis nearly always starts from a tear in the cervix. The swelling is found on one or both sides of the uterus, not behind, except as a narrow bridge connecting the two sides. When it reaches the pelvic wall it lies close up to the bone, while in peritonitis the tips of the fingers can be inserted between it and the pelvic bones. A parametritis often spreads downward along the vagina, while peritonitis can only extend to the other side or upward, and as a rule it fills Douglas's pouch and pushes the uterus forward.

Prognosis.—Generally the inflammation ends in resolution in two weeks. If an abscess forms, the prognosis is less good, both as to life and time, but with proper care even that generally ends in recovery. If the suppuration is allowed to spread far, the patient's strength may be exhausted by the protracted fever and loss of substance through sinuous fistulous tracts. Rupture into the peritoneal cavity is fatal, unless a successful laparotomy can be promptly performed. If cellulitis forms part of a general infection, the prognosis is very doubtful.

LYMPHANGEITIS AND LYMPHOTHROMBOSIS.—Lymphangeitis may start from the vulva and lower part of the vagina. Ordinarily it is an affection of little importance. There is slight fever. Some red streaks may be seen on the skin. The process is arrested in the superficial inguinal glands, which rarely suppurate. Exceptionally, the deeper inguinal glands are implicated, and then peritonitis may follow.

The lymph-vessels of the uterus are the most common road of general puerperal infection, but the thrombosis and the infection may also remain local. The patient has the fever-symptoms. The uterus is enlarged and tender, especially near the cornua. There may be a little vomiting and some tympanites. The pulse is full.

Diagnosis.—Uterine lymphothrombosis differs from *cellulitis* and *local peritonitis* by the absence of swelling at the vaginal roof, and from *diffuse peritonitis* by the limitation of swelling to the lower part of the abdomen, the full pulse, and the absence of green vomit.

PERITONITIS.—The inflammation of the peritoneum may be *local*, that is, limited to the pelvis, or *diffuse*, extending more or less over the whole abdomen.

Like the other inflammations, *local peritonitis* begins with a chill, but this is much severer and more protracted, lasting from ten to twenty minutes. There is a peculiar intense pain in the lower part of the abdomen, which is extremely sensitive to touch. The temperature suddenly rises to 103° or 104° F. The pulse beats from 100 to 120 times per minute, and is small and hard. Respiration is rapid. The fever is continuous, ordinarily with an exacerbation in the evening. The patient has no appetite, but suffers from unquenchable thirst. The tongue is coated. The bowels are in the beginning constipated, later loose. There is in general some vomiting of food, mucus, and bile, and sometimes moderate hiccup. The lower part of the abdomen is distended. In order to lessen the tension the patient lies on her back and draws her knees up. The milk secretion is normal or scant. The lochia are less in amount, of a dirty color, and often of offensive odor.

In the course of a week or two a distinct tumor is felt occupying the pelvis and the nearest part of the abdomen. It is formed by an exudation walled off by the agglutinated intestine, omentum, uterus, and appendages. The exudation pushes the vaginal vault down so that the cervix disappears, and cervix and body of the uterus form together one pear-shaped body without a line of demarcation between the two. The abdominal surface of the tumor is uneven, and it offers a different degree of resistance in different parts. Sometimes, on light pressure, we have a sensation similar to that in pressing a snowball. This is due to fresh adhesions rupturing under the pressure.

The inflammation commonly ends in resolution, the fluid being absorbed, and the hard swelling subsiding in the course of two or three weeks. Pain and fever cease.

But the exudation may also become purulent. Then the fever continues, and the patient has repeated chills. The swelling becomes boggy, and sometimes fluctuation may be felt in the vagina. The abscess may open into one of the hollow organs, especially the vagina. If it progresses towards the bladder or the rectum, there may be dysuria or tenesmus. When the abscess breaks, a large amount of offensive pus and grumous substance is evacuated. Pain and fever may cease. The opening may close, but sometimes the abscess refills, or if there are several separate pus collections, the process may be tedious and exhaust the patient. The pus may also follow the outside of the vagina and break through the skin in the ischiorectal fossa. Sometimes the bowel or the bladder becomes inflamed, or a pyelonephritis develops.

Prognosis.—As a rule, local peritonitis ends in recovery, but it may become diffuse or exhaust the patient's strength. As to complete restoration to health, the prognosis must be guarded. The disease is apt to return. Often chronic salpingitis and oöphoritis remain and make the patient more or less of an invalid. It is a frequent cause of sterility, and if the patient becomes pregnant again, there is a tendency to a similar attack.

Diffuse peritonitis has symptoms like the local, but much intensified. It begins commonly from two to four days after delivery, but sometimes immediately after parturition. The chill lasts from half an hour to several hours. The pain is excruciating and spreads all over the abdomen. The pulse is small and beats from 120 to 140 per minute. The temperature is 104° F. or more. The respiration ranges from 26 to 56, and it is shallow on account of the pain produced by the movement of the diaphragm and on account of the compression of the lungs by the intestine inflated with gas. The patient lies on her back. She shuns every movement and dreads every approach. Even the weight of the bedclothes may be intolerable. Her face expresses the greatest anxiety and pain. Her features are pinched, the corners of her mouth drawn down; the eyes sink deep into their sockets, and are surrounded by black rings. The skin is pale, the tongue dry, red at the point and edges, and brown in the middle. The thirst is unquenchable. The patient vomits continuously, and the vomit soon gets a characteristic appearance, like chopped spinach. Often the patient has diarrhœa, and sometimes her sufferings are intensified by constant hiccup.

The urine is scant and often contains albumin. Frequently there is retention. The milk-secretion soon ceases. The lochia diminish and are often offensive or disappear.

The abdomen is enormously distended. The percussion tone is tympanitic in front, dull on the dependent parts. The pectoral organs are pushed up. The heart is weak and becomes paralyzed by absorption of toxines.

The patient suffers from insomnia, and at the same time she is in a somnolent condition. She is slow to answer questions or is delirious, but sometimes the intellect remains clear to the last. At times she starts up as if horrified by dreams, and looks around in dismay. After three or four days the aspect changes. The pain ceases, the patient thinks she is well, but death ends the painful scene between the seventh and tenth days. Sometimes there is a relapse when the inflammation reaches the stomach.

Prognosis.—Diffuse peritonitis is one of the most dangerous forms of puerperal infection, but the patient may recover.

Favorable signs are subsidence of the fever, diminution of tympanites, cessation of vomiting, freedom from pain, return of appetite, clearness of mind, and cheerfulness. Unfavorable signs are an irregular pulse or one beating more than 140 per minute; a temperature over 104° F.; a laborious respiration, over 40; colliquative diarrhœa; profuse perspiration; cold, clammy extremities; the appearance of red blotches on the skin; and cessation of pain, while the tympanites remains the same.

Death occurs generally after nine or ten days, but if an abscess ruptures into the peritoneum it follows in a day or two.

The exudation may be reabsorbed or encysted so as to form localized foci. Often the patient, if she recovers, remains invalidated.

PLEURISY.—Pleurisy may appear as solitary localization, but is most frequently a corollary to peritonitis or phlebitis, and is then easily overlooked, inasmuch as the patient's condition does not authorize a thorough physical examination. When pleurisy joins peritonitis or phlebitis, there may be an increase in fever, a new chill, or increased embarrassment of respiration.

Prognosis.—Pleurisy is a very serious form of puerperal infection. Ordinarily death occurs before the end of the second week.

PNEUMONIA.—Pneumonia may appear as hypostatic pneumonia in the posterior parts of the lungs or in disseminated foci anywhere. It is generally combined with pleurisy. The usual symptoms—cough, pain in the chest, dyspnœa, and bloody expectoration—may be absent, when the localization can be recognized only by the stethoscopic signs —crepitant râles, bronchial respiration, and dull or flat percussion.

Prognosis.—Pneumonia is a dangerous complication.

PERICARDITIS.—Pericarditis may be propagated through lymph-vessels of the diaphragm from peritonitis, or it may be due to emboli from phlebitis. The symptoms are usually merged in those of other inflammations, but friction sound may reveal the presence of false membranes, or an increased dulness may show that there is a fluid exudation around the heart.

PHLEGMASIA ALBA DOLENS.—Phlegmasia begins, as a rule, in the second week of the puerperium. There may be premonitory symptoms, such as anorexia, a bad taste, eructations, or a coated tongue. The inflammation is often ushered in by a chill. The patient is feverish, and the urine concentrated. The limb begins to swell from above, the upper part of the thigh being first affected, but from there the œdema may extend all over the limb, and later the other side may become swollen, too, either independently or through extension of the thrombosis to the vena cava inferior. The skin becomes tense, of a white or pink color, and the patient complains of severe pain and heaviness of the leg. The epidermis may become raised in vesicles. In the *phlebitic form* the veins may be felt as hard strings. The disease usually ends in resolution in from three to six weeks. It may end also in suppuration, and abscesses may break on the skin, and still the patient may recover. It may also end in gangrene or septicæmia and death.

Sometimes the skin has a dark-purple color, which variety is called *phlegmasia cærulea dolens.* It is due to the thrombosis and inflammation of the deep veins of the thigh.

The thrombus is generally reabsorbed, but may become infected and give rise to all the above-described metastases.

The *cellulitic form* is a more violent type. It is accompanied by high fever and intense pain. The skin becomes red, pus-filled blebs may raise the epidermis, the connective tissue suppurates and becomes necrotic. It may be expelled in large shreds and the openings heal, but there is great danger of the patient becoming exhausted by the protracted suppuration, or gangrene or general septicæmia may develop and end her life.

PHLEBITIS.—Phlebitis may develop in the lower extremity or in the uterus.

Isolated *phlebitis of the leg* is not rare or grave, and will be elucidated later. Exceptionally the thrombus may become infected and give rise to general infection.

Uterine Phlebitis, or Metrophlebitis.—The veins of the uterus may become the seat of a common thrombosis, which may extend to the iliac veins and the vena cava or to those of the thigh, where it causes phlegmasia alba dolens. This benign thrombosis ends in resolution. But if the thrombi become infected, we have one of the most dangerous forms of puerperal infection, which leads to *pyæmia.*

Uterine phlebitis develops later than peritonitis. As a rule, the initial chill does not come before the fifth, sixth, or seventh day. It is severe and protracted, and is followed by similar attacks at irregular intervals. They are due to the entrance of microbes or their products into the blood. While the patient shakes with a subjective sensation of cold the thermometer shows a temperature ranging from 104° to 108° F. The pulse beats from 140 to 160. The respiration is as frequent as from 36 to 56 per minute. Rarely the chill is represented only by a slighter chilly sensation. After the chills, especially the first, the patient feels better, temperature falls to 100° or 101°, pulse and respiration become much less frequent. Entirely different from what we have seen in peritonitis, in uterine phlebitis there is no pain, little tenderness, and no tympanites.

Another chief feature of metrophlebitis is the occurrence of metastases due to the localization of the microbes in different organs. For each new localization there is a new chill, until the fever approaches the continuous type with exacerbations. The skin becomes yellowish, or a true jaundice develops, the features are pinched, the tongue coated, often the breath has a peculiar nauseous smell designated as "sweet." The patient has no appetite, but great thirst, headache, insomnia, sometimes diarrhœa, less frequently vomiting. The urine is scant and nearly always contains albumin.

In mild cases there may be only two or three chills in the course of a week, and the disease may end in recovery without localizations. In the severe cases the secondary infection appears first in the lungs, then in the pleura, the heart, the liver, the kidneys, the spleen, the intestine, the meninges, the brain, the eyes, the muscle-sheaths, especially those of the forearm, the articulations, the skin, and the connective tissue. Late uterine hemorrhage is rare, but very dangerous. Pneumonia, pleurisy, and pericarditis have already been noticed in connection with peritonitis.

Etiology.—Metrophlebitis is especially likely to occur when a piece of placenta has been left behind or after the artificial detachment or the low insertion of the placenta, particularly placenta prævia. In obstetric operations in which the hand is introduced into the uterus it is not rare. It is less frequently attributable to carcinoma of the cervix or deep lacerations of the perineum.

Diagnosis.—Uterine phlebitis is often taken for *malarial fever*, but the chills come at irregular intervals, and later the fever becomes continuous. Swollen veins may be felt in the pelvis, and phlegmasia alba dolens may develop in the leg. There is a tendency to uterine hemorrhage. The blood does not contain the plasmodium, but sometimes streptococci are found. The appearance of localizations is pathognomonic.

The differentiation from *typhoid fever* may be more difficult, since adynamic and ataxic symptoms may be found in both, and real typhoid fever may attack a puerpera, which, however, is rare. But typhoid fever develops gradually, while uterine phlebitis begins suddenly with a severe chill and high fever, followed by almost normal temperature. Typhoid fever is characterized by continuous fever, ochre-colored stools, gargouillement and tenderness on pressure in the right iliac fossa, and the appearance of a few discrete, small, pink spots on the abdomen. Visceral complications are rare. In uterine phlebitis there may be gargouillement, but no tenderness in the right iliac fossa. There may be a skin eruption, but that is spread over larger surfaces as erysipelas, erythema, papules, or petechiæ. There is no regular fever-curve, and nearly all organs may become the seat of localizations.

If the infection follows the *lymph-vessels*, fever begins earlier, from two to five days after delivery. The chill is not so pronounced or repeated. The fever is continuous. There is pain in the lower part of the abdomen, with great tenderness on pressure, the uterus is large, and the infection has a tendency to spread rapidly upward to the peritoneum. Phlebitis begins later, towards the end of the first week. There is a severe chill, followed by others with comparatively free intervals. There is no pain and little sensitiveness. The uterus is better contracted. There generally come localizations with infarctions and abscesses in the viscera.

ENDOCARDITIS.—The inflammation of the endocardium may be found as the only localization of the infection, without pyæmia. Then it begins in the first days of the puerpery with an intense chill. The fever runs high with slight remissions. Much less frequently it has an intermittent type. The central nervous system is much affected. The patient has headache, vertigo, insomnia alternating with harassing dreams. She is listless, weak, delirious. She is in a stuporous condition and talks in a murmuring way or sinks into deep coma. More rarely she may become maniacal. The muscles of the neck are contracted; she grinds her teeth, squints, enters into convulsions, or becomes paralyzed. Hemorrhage often takes place in the retina, less frequently in the choroidea or iris. The whole eye may be destroyed by suppuration. In the skin is often found hemorrhage, roseola, a scarlatiniform or pemphigoid eruption. Sometimes the patient has diarrhœa. The disease lasts from ten to twenty days or even four weeks.

When endocarditis comes as part of metrophlebitis it appears late in the puerpery, from ten to fifteen days after delivery. It is accompanied by an increase in fever and somnolence. New localizations may follow the rupture of cardiac abscesses, but the symptoms of these are lost in those already present.

The *diagnosis* is based on the cerebral and ocular symptoms. Heart sounds are unreliable. Murmurs may be heard without endocarditis and be absent with it. *Typhoid fever* is characterized by its typical fever-curve, the slight skin eruption, the ochre-colored stools, and tenderness in the right iliac fossa. In *uræmia* vomiting is a predominant symptom.

Etiology.—Women who have had inflammatory rheumatism which has left the cardiac valves rough and uneven, are predisposed to puerperal endocarditis.

Pathology.—The left half of the heart is more affected than the right. The valves are thickened and covered with a deposit that cannot be scraped off. At the same time there is ulceration with a loss of substance in other places. In the wall of the heart are often found miliary abscesses, which may break and empty their contents —microbes and their chemical products—into the blood-current, carries them through the whole system and gives rise to new localizations. The microscope reveals that the exudation and ulcers on the valves and the formation of abscesses are due to colonies of cocci.

A similar process is more rarely found on the tricuspid valve or in the pulmonary veins.

The kidneys often contain miliary abscesses. The dura and pia mater may be the seat of suppurative inflammation, and in the brain may be abscesses. Sometimes there is hemorrhage of the meninges or in the eye.

The *prognosis* of endocarditis is bad.

Disturbances in the Alimentary Canal.—The tongue is coated in metrophlebitis, dry, and sometimes the seat of thrush. There are anorexia, thirst, profuse diarrhœa, and sometimes vomiting. Rarely abscesses appear in the parotid, the thyroid gland, or the tonsils, but their appearance is an unfavorable prognostic sign.

The *liver* is frequently implicated. Then the skin becomes yellow and often a complete jaundice is developed. The gland is enlarged and tender on pressure. In connection with peritonitis there may be perihepatitis with formation of adhesions, which on pressure give that crepitation we have spoken of above. Puerperal jaundice is nearly always fatal.

The *spleen* may become inflamed. The patient may complain of pain and tenderness in that region, the organ may be felt enlarged, and the area of dulness may be increased. If an abscess forms and ruptures into the peritoneal cavity, acute peritonitis and death follow. But mostly the symptoms of splenitis are so merged in others that they are not recognizable.

Nephritis.—The inflammation of the kidneys is very common and is characterized by the presence of albumin and casts in the urine, whereas the ordinary symptoms of kidney inflammation—such as headache, disturbed vision, lumbar pain, and vomiting,—are lost in the general condition. An inflammation of the adipose capsule may perhaps reveal itself by a constant soreness in the lumbar region.

Disturbances in the Nervous System.—Many nervous disturbances, such as headache, neuralgia, convulsions, paralysis, insomnia, tetany, delirium, insanity, etc., may occur during the puerperium without being due to puerperal infection. They may be caused by anæmia or hyperæmia of the brain, by pressure on a nerve-trunk, by a reflex action, hysteria, etc. But in other cases the nervous phenomena are caused by metrophlebitis and its metastases, especially endocarditis. There may be purulent meningitis or encephalitis or thrombosis.

Insanity is in most cases idiopathic and may have preceded pregnancy or developed during it. Sometimes it is due to absorption of toxines, as when it follows eclampsia or uræmia. In many cases there is an hereditary predisposition. Primiparæ are more prone to insanity than pluriparæ. But in some cases the insanity is plainly due to infection with microbes, which are carried to the brain and its meninges from the genitals. Then insanity is preceded by fever.

These patients are mostly melancholic, with a tendency to suicide and sometimes to murder. They should, therefore, be watched closely.

Arthritis.—Puerperal infection sometimes affects the joints, especially the larger articulations of the extremities—the knee, the elbow, or the shoulder. Among those of the trunk, the symphysis pubis, the sacro-iliac, and the sternoclavicular articulations are most frequently the seat of the localization. Sometimes many joints are affected simultaneously, but the inflammation disappears in most of them, and remains only in one or two.

The affected articulations become swollen, red, and painful, and there is a marked tendency to the formation of pyarthrosis, in which respect puerperal arthritis differs from rheumatic and gonorrhœic. The abscess may break through the integuments of the joint. All the tissues, even cartilages and bones, may be destroyed, and if the patient survives the joint remains ankylosed.

Phlegmon (Cellulitis of the Limbs).—The subcutaneous and the intermuscular connective tissue of the limbs may become inflamed. The limb swells, the skin becomes red and hot, there is œdema or fluctuation. Circumscribed abscesses or wide-spread destructions may follow. This diffuse phlegmon is very dangerous.

Skin Diseases.—A puerpera may be attacked by eruptive fevers, such as measles, scarlet fever, or erysipelas. Some eruptions may be due to the use of certain drugs, such as quinine, iodide of potassium, iodoform, salicylic acid, or copaiba. *Miliaria* may appear in consequence of profuse perspiration.

In other cases, again, the eruption is a sign of puerperal infection. Thus, an *erythema* may extend more or less from the genitals, or large purplish blotches or smaller papules may appear on any part of the body. Puerperal eruptions have a darker color and come and go. In other cases there are *petechiæ*, small dark spots due to capillary hemorrhage in the skin. They do not disappear on pressure and are a bad prognostic sign. *Vesicles*, filled with serum like pemphigus, or *bullæ*, filled with pus, may raise the epidermis. Puerperæ are also very liable to *bed-sores*. Puerperal skin eruptions are combined with other localizations.

Acutest Septicæmia.—This, the most dangerous of all forms of puerperal infection, has, in consequence of antiseptic and aseptic measures, become very rare, and has disappeared from well-conducted lying-in hospitals, where in pre-antiseptic times it frequently broke out as so-called "epidemics of puerperal fever."

It is sometimes caused by pressure gangrene due to narrowness of the pelvis. In some cases streptococci have been found in the blood, but most frequently there are no microbes.

This condition is ushered in by a long and severe chill. Pulse and respiration are frequent. The temperature may be high, and then without those remissions we find in metrophlebitis, but in other cases it may be normal or even below normal. The features are pinched, the skin is pale or purplish, the tongue dry and brown. The patient is somnolent, delirious, or comatose. The stools are loose, dark, offensive, and copious. The urine is scant and loaded with albumin. Death follows in a day or two.

MORTALITY.—With the sole exception of tuberculosis, "puerperal fever" is the most fatal disease for women in the child-bearing period, between 15 and 45 years of age; and if we take the interval between the 25th and the 35th year, in which most children are born, 1 death in every 6 is due to "puerperal fever."

In Prussia there died during sixty years (1816–1875) 0.8 per cent. of all confined women, or, more exactly, 8322 out of every 1,000,000. The governmental introduction of the use of antiseptic drugs in confinement cases during the following eleven years (1876–1886), reduced this mortality to 0.58 per cent., or a little less than 6 per 1000. In Saxony there were, from 1883 to 1896, 2,043,176 births, with 12,594 deaths,—61.63 per 10,000, or about 6 per 1000.

In lying-in hospitals we might expect a greater mortality, because many of the worst cases are likely to gravitate to them. On the other hand, antiseptic and aseptic midwifery is carried out with such a thoroughness there as can hardly be obtained in private practice. The results are, therefore, better than might be expected.

In the German lying-in hospitals there were from 1882 to 1895 in 41,200 confinements 334 deaths—0.81 per cent.[20] It is slightly higher in New York Maternity Hospital,—0.87,—but lower in the Sloane Maternity, where in the first 1000 confinements they had only 6 deaths.

GONORRHŒIC INFECTION.—Gonorrhœic infection forms really part of puerperal infection. The gonococcus may, like the streptococcus, the staphylococcus, and others, lead to both local and general infection, to peritonitis, arthritis, endocarditis, and death. Still, the affection deserves particular attention, because it is caused by a peculiar microbe, the gonococcus of Neisser, because it is a common cause of autoinfection, and because, as a rule, it is less dangerous than infection with the other cocci.

The patient may have the remnants of an old gonorrhœa, which did not cause any symptoms before childbirth. There may have been only a few gonococci in her vagina, but a few days after delivery they abound. It seems that the lochial discharge constitutes a peculiarly favorable soil for the propagation of this microbe, which then may ascend into the uterus.

In the beginning of the puerperium there may be not any or only very slight symptoms, such as moderate pain in the uterus and a little fever, and the disease may stop short; but two or three weeks after delivery pyosalpinx, oöphoritis, and pelvic peritonitis may develop. In exceptional cases this may even happen early in the puerpery.

The *diagnosis* is based on the presence of gonococci, of venereal warts on the genitals of the mother, and of ophthalmia neonatorum in the child. Gonococci may be the only infecting agent, but in other cases they are found together with streptococci and staphylococci.

The *treatment* should chiefly be directed towards the vagina, where lysol douches (not corrosive sublimate) may be used to advantage. Intra-uterine injections and curetting are contraindicated. The other inflammations are treated with ice and opium.

§ 5. **Treatment.**—Puerperal infection being due to microbes, the prophylaxis and treatment must be directed against these organisms.

We know now that puerperal infection nearly always is a wound disease, and the methods by which it is combated are similar to those used in general surgery. Obstetricians were even ahead of the surgeons in recognizing the source of sepsis and inventing remedies against it; but, strange enough, they did not succeed in convincing their own colleagues until the value of the new methods was made irrefutable by the results obtained by surgeons.

The father of antiseptic midwifery was the Viennese obstetrician Semmelweis. I have looked in vain for his name in several large encyclopædias that mention every worthless potentate and every general who killed his fellow-men on the battle-field; and still he was the first to understand the nature of one of the greatest scourges of mankind and to point out a preventive against it. As early as 1847 Semmelweis attributed "puerperal fever" to infection from decaying cadavers and other sources, and he introduced disinfection of the hands by means of chloride of lime; but he preached to deaf ears and ended his days in a mad-house. Half a century had to elapse before a statue was erected in memory of him. Obstetricians all over the world went on carrying disease and death from patient to patient, until Stadfeldt in Copenhagen and Bischoff in Basel simultaneously and independently of each other applied the teachings of Joseph Lister to obstetrics by introducing the use of carbolic acid (1870).

The French obstetrician Tarnier found by experimenting with placentas the great antiseptic value of bichloride of mercury. He introduced it as a local remedy in puerperal fever, and submitted his results to the International Medical Congress assembled in London in 1881, but the great discovery passed unnoticed until the bacteriologist Robert Koch, in his laboratory in Berlin, and the surgeon Schede, in his hospital in Hamburg, showed the immense value of this drug in preventing and combating microbic life. Then (in 1883) it was introduced in many lying-in hospitals. In America it was first introduced by the writer on the first day of October, 1883.

With it came a complete revolution in obstetrics, but it has later been found that this in reality was not due to the drug, but to the way of using it. We had for years practised what was then believed to be antiseptic midwifery, because carbolic acid was employed, and some women were even delivered under antiseptic spray. But with the year 1883 came the *strict* disinfection of hands, instruments, dressing material, etc.

Several large clinics never changed carbolic acid for bichloride of mercury, and had just as good results. It was even found that bichloride of mercury was a particularly dangerous drug to use on pregnant, parturient, and puerperal women, and its use has, therefore, in the course of time been much limited, and it has in part given way to innocuous substances, like creolin or lysol. Later, the *aseptic method*, which destroys germs by heat, has to some extent replaced its older sister, the *antiseptic method*, which relied on the germicidal power of certain chemicals; but even in general surgery the older method is indispensable, and this applies still more to obstetrics.

Statistics are proverbially dry reading, but I cannot in any better way show the reader the importance of the change made in 1883 than by comparing the mortality in the New York Maternity Hospital before and after that memorable date.

The maternity service was before 1875 connected with Bellevue Hospital; but the mortality was so appalling that the service was transferred to Blackwell's Island, and made an annex of Charity Hospital (later called City Hospital). From that time the statistics were as follows:

Year.	Deliveries.	Deaths.	Per cent.
1875	570	15	2.63
1876	536	20	3.73
1877	480	32	6.67
1878	255	7	2.75
1879	254	11	4.33
1880	149	8	5.37
1881	382	9	2.36
1882	431	14	3.25
1883	447	30[1]	6.71
Total	3504	146	4.17

[1] All during the first nine months of the year.

During the last six months before the change in treatment was made there were delivered 237 women, 19 of whom, or 8 per cent., died, and of these 17, or 7.17 per cent., succumbed to sepsis. During the last month the mortality reached ten out of fifty, or 20 per cent., and that from sepsis, 15.69 per cent.

During the first three months after the change there were delivered 102 women without a single death, which at that time seemed little short of miraculous. The following table shows the mortality in Maternity Hospital during the first ten years after the change:

Year.	Deliveries.	Mortality. Total.	Mortality. From Sepsis.	Per cent. Total Mortality.	From Sepsis.
1884	522	8	4	1.53	0.76
1885	537	3	0	0.56	0.00
1886	446	5	1	1.12	0.22
1887	389	5	1	1.30	0.26
1888	377	3	0	0.79	0.00
1889	314	1	0	0.32	0.00
1890	345	4	1	1.13	0.29
1891	240	1	0	0.42	0.00
1892	314	1	0	0.32	0.00
1893	305	2	0	0.66	0.00
Total	3789	33	7	0.87	0.18

By comparing this table with the preceding, we find that the mortality from all causes decreased from 4.17 to 0.87 per cent., that is to say, to nearly one-fifth of what it was before.

In regard to *morbidity* a no less striking change took place, but, not having the necessary material at command, the writer must confine himself to an example. During the six months, from October 1, 1882, to April 1, 1883, of which period he possesses exact notes for the whole service, 192 women were delivered, 46 of whom, or nearly 1 out of 4, were seriously ill, and 39, or nearly 1 in 5, suffered from puerperal inflammation, which nowadays is attributed to infection. After the change in treatment a sick puerpera became a rare sight. By sick I here mean ill enough to feel so and demand therapeutic care. It would be utter waste of time if we should examine all the temperatures registered before and after the change. We had often
iderable difficulty in obtaining thermometers. Those we obtained
the cheapest kind. The temperatures were measured by
. The charts made from them were of great value to
etrician, but they could not possibly be used for com-
tion with others, as they do in Germany, where they
tient as sick whose temperature at any time rises

the treatment of puerperal infection, we must distinguish between hospital practice and private practice, prophylaxis and curative treatment, which again may be medical or surgical.

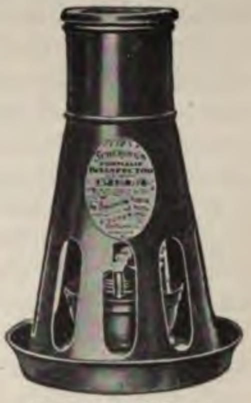
I. Prevention of Puerperal Infection in Hospitals.—Most of what relates to the precautions to be taken to avoid puerperal infection has been discussed in speaking of lying-in hospitals (see pp. 218–222).

No visitors should be admitted to the wards in which women are kept the first nine days after delivery. Since the patients only stay there so short a time there is less necessity for seeing their friends. It is a common experience in hospitals that temperatures generally go up on visiting-days, and lying-in women are unusually emotional. Besides, the visitors often come from large, crowded tenements, and there is therefore a positive danger of their bringing the germs of measles, scarlet fever, or diphtheria to the patients in the hospital.

The members of the house staff should not be permitted to enter wards in which other patients are kept, from whom infection might be brought to the parturient or newly confined women. Still less should they enter the dead-house or have anything to do with pathological specimens.

While in this way we try to keep all special sources of infection away from the lying-in hospital, we should do all that is in our power to destroy germs of infection that otherwise might reach the patients. The underlying principle is that puerperal infection is due to microbes which are found everywhere,—on the patient, on the doctors, on the nurses, on instruments, on dressing material, on clothes, on furniture, and even in the air of the room.

Fig. 489.



Formalin disinfector.

Disinfection of Wards.—There should be a constant regular rotation in the use of the wards. As soon as one set of patients has been treated in a ward, it should be thoroughly disinfected. This may be done in the following way. The bedclothes are removed from the beds, sheets are sent to the laundry, blankets are spread over the ends of the beds, unless they too need washing. If mattresses are used, the straw should be burned and the ticks washed. In Maternity Hospital we disinfected the wards with sulphur. All windows and doors were closed, and thirty pounds of sulphur burned in an iron pan, under which was another pan with water. The sulphur was moistened with alcohol, so as easily to catch fire. After at least six hours doors and windows were opened, and if the ward was not needed immediately it was aired for several days. But according to bacteriologists the disinfection by means of formalin is much more effective. Schering's formalin disinfector (Fig. 489) is arranged for the vaporization at one time of 250 pastils, containing each 15 grains (1 gramme) of paraform, in which form the formaldehyde is harmless. After the fumigation the floors, the walls, and the furniture were scrubbed with soap and water and thereafter with bichloride of mercury (1 : 1000). The bedsteads are made of enamelled iron and the mattresses of woven wire. All bedclothes and linen used by sick puerperæ were immersed in the same solution of corrosive sublimate for an hour, and then washed before being sent to the common laundry. Patients and nurses wore only clothes made of washable goods. The clothes of the doctors who had been engaged in the isolation department were hung up in a small room and fumigated with sulphur.

Disinfection of Patient.—When a patient is taken in labor, she is given a general warm bath and scrubbed with soap, and dressed in clean clothes. Next, she is placed on the delivery-bed on a rubber blanket that has been disinfected with corrosive sublimate or sterilized by heat. The abdomen, buttocks, and thighs are washed with corrosive sublimate (1 : 2000), taking particular care to clean every furrow at the genitals and umbilicus.

Disinfection of Doctors and Nurses.—The obstetrician takes off his coat, vest, necktie, collar, and cuffs, rolls up the sleeves of his shirt and undershirt to the middle of the arm above the elbow, and ties a rubber apron around his body from the armpits to the ankles. He disinfects hands and arms with potassa soap, hot water, and corrosive sublimate as described (p. 218), and finally he dons a sterilized gown and cap. He is now ready for work, but as it is next to impossible in obstetric practice wholly to avoid handling anything from which new germs might be carried to the patient, a basin with lysol emulsion (1 : 100) is kept at the bedside, in which he immerses his hand before touching the patient.

The nurses disinfect themselves in the same way.

The use of bichloride of mercury for disinfection may be supplemented by other disinfectants, such as lysol, chlorine, and alcohol. Chlorine is developed by mixing a teaspoonful of chlorinated lime with as much carbonate of potassium and a little water so as to form a paste, with which hands and arms are smeared, and then rinsed with water. After that they may be immersed in lysol (1 : 100), which renders its smoothness to the skin roughened by corrosive sublimate. And, finally, they may be immersed in alcohol or rubbed with pledgets of absorbent cotton or a flannel rag soaked in the same.

Disinfection of Materials.—All materials, such as gauze, absorbent ., that come in contact with the genitals, should be sterilized by moving steam under high pressure. No sponges are used. They have been replaced by absorbent cotton and gauze.

Disinfection of Instruments.—All instruments are sterilized by boiling them for five minutes in a solution of washing-soda (a tablespoonful for each quart of water), and after being used they are carefully cleaned with soap and water and kept in a suitable closet. All instruments composed of several parts should be taken apart. All sutures and ligatures should be sterile. Silkworm gut may be boiled in water and kept in alcohol. Silk may be disinfected by exposing it for an hour to the steam of the sterilizer. Catgut may be sterilized by treating it with formalin, cumol, or dry heat.[1]

Antiseptic Conduct of Labor.—Vaginal examinations are restricted as much as possible, and immediately before each the accoucheur disinfects his hands. The vulva is spread wide open. Under ordinary circumstances the examining finger does not enter beyond the external os, so as to avoid carrying any germs from the vulva, the vagina, or the cervix to the uterine cavity. No lubricants are used for hands or instruments, the adherent lysol or creolin being amply sufficient. The only exception from this rule is when it becomes necessary to introduce the whole hand,—for instance, in podalic version or artificial removal of the placenta. Then the dorsal surface of the hand should be made slippery with sterilized oil, alboline, lubrichondrin, or white vaseline in tubes, or mollin impregnated with five per cent. carbolic acid.

When the head begins to open the rima pudendi, the genitals are covered with a sterile gauze pad, which serves the double purpose of keeping out microbes and mechanically facilitating all manipulations by obviating too great slipperiness.

The placenta is removed by expression (see p. 196). If on inspection any part of it is missing, the well-disinfected hand should be introduced and the remnant scraped off with the nails, while the uterus is steadied from without with the other hand. If a large piece of the membranes is retained, it may be removed in the same way; or, if it is within reach from the vulva, a silk thread may be tied to it, by pulling on which the next day the retained portion comes out.

A prophylactic intra-uterine injection is given when the uterus has been entered (p. 580).

Next, the patient is cleaned and the abdominal binder and perineal occlusion-dressing put on as described under THE CONDUCT OF NORMAL LABOR (p. 200), only instead of dipping the pad in antiseptic fluid it is sterilized by steam.

Ergot.—Since good uterine contraction is a preventive of infection, ergot forms part of the preventive antisepsis. A drachm of the fluid extract is given three times a day during the first three days.

---

[1] For details see Garrigues, Diseases of Women, third ed., pp. 213–215.

Perineorrhaphy.—All lacerations of the perineum should be immediately repaired, as thereby we close the door against the entrance of microbes (see p. 543).

Catheterization.—If the patient cannot urinate, which is especially common after perineorrhaphy, the urine must be drawn with a catheter. Before doing so the vulva should be spread open and the surroundings of the meatus washed with creolin or lysol emulsion. The catheter is, of course, disinfected. For common use glass catheters are the best, and are disinfected by boiling in soda solution; but if there is any resistance to overcome, as when the head presses on the urethra, the glass might break. Then some other kind is needed (see pp. 434, 607).

Syringes.—Syringes have probably done greater harm than any other instrument. Being used on one patient after the other without disinfection they were probably the greatest carrier of infection. In hospitals glass nozzles should be used, which are easily disinfected and so cheap that one does not hesitate to destroy them when they have been used in an infected patient.

II. Prevention of Puerperal Infection in Private Practice.—All over the civilized world lying-in hospitals now use similar antiseptic and aseptic precautions, and the result has been that their mortality ranges as low as from 0.8 down to 0.3 per cent. In private practice some little improvement has been statistically demonstrated to have taken place in some localities; in others there is none. This unsatisfactory showing is due to the fact that midwives and physicians have only reluctantly followed the movement that has revolutionized modern obstetrics, or have kept entirely aloof from it. Nearly one-half the confinements in the city of New York are in the hands of midwives, who come from all parts of the world or have taken a short course in one of the private schools of midwifery in the city. They are under no control. Since even in countries where they study two years, where they are taught by university professors, where they must pass an examination before they can practise midwifery, and where they are under constant control of physicians appointed by the government—since even there constant complaints are made about their inefficiency, and especially the unsatisfactory way in which they use antiseptics, we may take it for granted that in America they practically do not use them at all. Unfortunately, it is not much better among physicians. Outside of the small number who have received their training in lying-in hospitals, it is to be feared that they either do not use any preventives at all or use them in such a happy-go-lucky way that little benefit is derived from them. The result is that, while formerly lying-in hospitals were responsible for much suffering, many deaths, and whole epidemics, they have now become the safest places in the world to be confined in. In private practice the mortality is *two or three times as large as in well-conducted hospitals.*

On October 27, 1892, the Obstetric Section of the New York Academy of Medicine, on a motion by the writer, unanimously passed the following resolution:

> *Whereas,* Experience, both in this country and abroad, shows that by strict antiseptic measures the total mortality in lying-in hospitals may be reduced to a few per thousand;
>
> *Whereas,* Deaths due to childbirth or to abortion yet are common in private practice;
>
> *Resolved,* That, in the opinion of the Obstetric Section of the New York Academy of Medicine, it is the duty of every physician practising midwifery to surround such cases in private practice with the same safeguards that are being used in hospitals.

Since this resolution was formulated considerable changes have been made in hospital practice, the rules of aseptic midwifery having replaced those of antiseptic midwifery. In private practice the author thinks we should chiefly be satisfied with antiseptic measures (see pp. 185, 594). The rules for the antiseptic conduct of labor in private practice have been given above in speaking of the management of normal labor (pp. 188–190). It has also been shown how the expense may be reduced to a minimum where the patient's means do not allow more elaborate measures (p. 202). The disinfection of the vagina previous to operations is described on page 567.

For suture material it is convenient to use that prepared by reliable manufacturers by boiling in alcohol, at a high temperature, in hermetically closed glass tubes, which is easily carried in the satchel.

If only physicians and nurses would understand that to make a vaginal examination during labor without disinfecting the hands is to expose the patient to the danger of painful, perhaps incurable, disease or death! If no measurements have been taken of pelvis and fœtus, a serious mechanical disproportion may appear unexpectedly during the course of labor. The most severe complications, such as hemorrhage or convulsions, may call for immediate interference. The most dangerous operations, such as symphyseotomy, Cæsarean section, or Porro's operation, may become necessary. Even the choice of the operation often depends upon the aseptic or septic condition of the patient, that being the predominant factor in the result. Every labor should, therefore, from the very beginning and throughout its course be conducted according to the rules of antiseptic midwifery. If then complications arise for which the help of the expert is sought, he finds a clean field, where his knowledge and skill may be displayed to his own honor and the welfare of the patient. Otherwise, all his learning and talent may be of no avail.

III. Curative Treatment of Puerperal Infection.—While we have made such astounding progress within the last twenty years in the prevention of puerperal infection, little has been accomplished in the way of a cure when once the disease has started. We shall in the exposition of the therapeutic and surgical means at our command in combating it follow the same anatomical divisions as heretofore; but, in order to avoid endless repetitions, a procedure will be mentioned only in speaking of that organ in the affection of which it is chiefly used, but it should be understood that similar conditions in other organs are treated in the same way. Thus the temperature-reducing remedies are described under peritonitis, but a high temperature due to metrophlebitis or other inflammations demands the same treatment.

Some general rules may help the practitioner in the choice of the remedial resources in the particular cases.

1. The first indication is to remove those microbes which are in the genital canal, but have not yet entered the tissues. This is done by ablutions and injections with antiseptic fluids.

2. The second indication is to seal the entrances into the tissue, which is done by means of cauterization.

3. The third indication is to clean the intestinal canal by enemas, aperient medicines, and internal antiseptics.

4. The fourth indication is to sustain the patient's strength in order to give her a chance of throwing out the organisms and the poison that already have invaded her tissues and circulate with her blood. For this purpose stimulants are used freely; as much substantial food should be given as the patient can digest; and tonic drugs should be administered.

5. The fifth indication is to combat pain, which exhausts vitality. This is done with narcotics and the local application of ice.

6. The sixth indication is to reduce the patient's temperature when it becomes dangerously high, which indication is met with refreshing ablutions, ice-bags, ice-water coils, or cooling baths.

Sapræmia.—Sometimes the lochia become fetid, pulse and respiration are accelerated, the temperature may rise to 102° F., but there is no pain, no tenderness, no swelling, no ulceration, and no somnolence. This condition is probably due to a mild degree of infection with saprophytes. Often a blood-clot hidden in the deep posterior vault of the vagina or in the interior of the uterus or retention of the lochia in the uterine cavity, so-called *lochiometra*, is the cause. Health is generally soon restored by raising and slightly squeezing the uterus, using vaginal douches with lysol or creolin every three hours, and giving a saline aperient and a capsule with five grains of quinine three four times a day.

ÆDŒITIS AND COLPITIS.—Simple catarrhal inflammation of the vulva and the vagina is treated with the just-named vaginal injections. Simple tears and abrasions heal under the occlusion-dressing. Exceptionally they may be dusted with iodoform, aristol, dermatol, stearate of zinc, or covered with this ointment:

℞ Iodoformi, ʒi (4 grammes);
Balsami peruviani, ʒii (8 grammes);
Vaselini, q. s. ad ℥ii (60 grammes).—M.

If the wounds become diphtheritic, the author touches them with a strong solution of chloride of zinc:

℞ Zinci chloridi,
Aquæ destillatæ, āā ʒi (4 grammes),

which is applied by means of absorbent cotton wound around some suitable stick, such as a toothpick, a match, or a lead-pencil. The caustic should be applied all over the infiltrated surface and held in contact for a minute. Besides, the vagina is syringed with creolin or lysol emulsion. If the perineum has been stitched, the sutures should be cut, as the surface is doomed to infection and must be cauterized. Tears in the deeper part of the vagina are made accessible by means of a bivalve speculum. The cauterization being very painful, the parts should be anæsthetized with a 10-per-cent. solution of cocaine, or general anæsthesia should be induced.

The chloride of zinc has the effect of making the ulcers milk-white. Later a grayish slough is produced, which is much like a diphtheritic patch, but may be distinguished from it by its plain contour, while the diphtheritic infiltration spreads with a scalloped outline.

The aim of this cauterization is a double one, namely, to kill the microbes on the surface of the wound and to seal the veins and lymphatics starting from it. The author has found chloride of zinc much more effective for this purpose than tincture of iodine, iodoform, liquor ferri chloridi, or Monsell's solution.

The bowels should be moved. Half an ounce of brandy or whiskey should be given every two hours, mixed with equal parts of milk or water. For a change eggnog may be given two or three times a day. If strong liquor is not well borne, champagne, madeira, port, sherry, malaga, marsala, tokay, or other strong wines may be substituted; but, as a rule, large amounts of alcohol can be taken without producing intoxication. If there is a patient suffering from diphtheria in the house, or if cultures made from the ulcers show the presence of the Klebs-Löffler bacillus of diphtheria, the corresponding antitoxin should be injected subcutaneously.

If there is *gangrene* of the vulva or the vagina, the stimulating treatment should be pushed still more. As soon as a line of demarcation is established, the dead tissue should be cut away with knife or scissors, and granulation promoted by the application of camphor emulsion (see under BED-SORES).

ENDOMETRITIS AND METRITIS.—When the uterus itself is the seat of the inflammation, the obstetrician must first of all know if it is empty or part of the secundines are retained and are undergoing decomposition. If there is the slightest doubt in this respect, the first indication is to examine the interior of the uterus and if any part of the after-birth is retained to remove it. For this purpose the patient is placed across the bed or on a table in the dorsal position, with the knees bent, separated, and elevated. She is anæsthetized. The operator introduces the disinfected and lubricated hand into the vagina and one or two fingers into the uterus. If necessary, the whole hand may be inserted. In cases of puerperal infection, the cervix often remains open and dilatable for many days. If necessary, it is dilated by means of dilators. As a rule, it is best to introduce the left hand, that being the smaller one. The other is placed on the fundus, steadies it, and presses it down against the internal hand. The accoucheur should go systematically over the whole interior surface, and pay special attention to the cornua, which are most difficult to reach, and where a piece of placenta is most frequently retained. If possible, it is an advantage to enter on one side of the retained part and loosen it all in one piece, by inserting the finger-nails with a sawing movement between it and the uterine wall. But if this cannot be done, one must remove it piecemeal. It is not necessary to withdraw the hand. By pressing the fingers against the palm of the hand, the detached portion is made to descend along the inside of the forearm to the os, from which all is finally removed in withdrawing the hand.

To scrape the uterus with the large dull wire curette in order to remove retained parts of the after-birth is not advisable. Immediately after delivery the removal is done much better with the hand, and when the uterus is infected, the scraping does more harm than
od. The writer does not remember ever to have seen a patient
r, when the curette was used after sepsis had set in after
To use curettage to scrape off the endometrium is still
ble. By the use of the curette we break down the
has built to keep out the infection from the deeper
y microbes right into the fine branches of veins

s has been cleared, it should be washed out with
–2 or 3 quarts—of a 1 per cent. solution of lysol

or creolin. But this should not be repeated. Bacteriological examinations have shown that shortly after an injection there are as many streptococci as before in the uterine cavity. They cannot be kept away by douching, and their virulence is not diminished by it. The injection often does positive harm. I have seen cases in which each intra-uterine injection caused a rise in temperature, and the patients got well when they were discontinued. Especially if they are given with a metal or glass tube, small wounds are torn open and new ones inflicted in the genital tract. But one copious injection is useful in removing *débris* and thoroughly cleaning the cavity.

After that the uterus may be packed with iodoform gauze. If there is no bleeding the author prefers the introduction once a day of an intra-uterine suppository with iodoform.

℞ Iodoformi, ʒv (20 grammes);
Amyli, ʒss (2 grammes);
Glycerini, flʒss (2 grammes);
Acaciæ, ʒi (4 grammes).—M.
Ft. suppositoria No. iii. of the size and shape of the little finger.

The suppository is introduced through a bivalve speculum by means of a forceps with the curvature of the uterine sound (Fig. 416, p. 574). If the patient's condition is satisfactory, the intra-uterine treatment is not repeated. But vaginal douches should be given every three hours, which prevent stagnation of infected fluid in the vagina and incite the uterus to contraction. Involution is also promoted by the administration of ergot and the application of the faradic current.

The inflammation and especially the pain are combated by cold. For this purpose a large ice-bag is placed on the hypogastric region, or the lower part of the abdomen is covered with a rubber coil with a permanent current of ice-water. In order to avoid local freezing, about four layers of muslin should be put between the ice-bag and the skin.

If the patient has diarrhœa, or the inflammation has the diphtheritic character, or otherwise there are signs of low vitality, cold is not well borne. Then a linseed-meal poultice or a double piece of flannel wrung out of hot water should take the place of the ice-bag, and be kept well covered with water-proof and woollen material. It is renewed as often as it cools off,—about every two hours.

When the inflammation subsides the ice-bag should be replaced by a Priessnitz compress, made of a towel wrung out of cold water and covered with water-proof. It becomes warm in a short time and furthers reabsorption of inflammatory products.

The internal treatment consists in quinine, moderate doses of alcohol, and a little opium.

If the cervix is the seat of *diphtheritic patches*, the treatment should be much more energetic. Then the whole cervical membrane is cauterized with the above-mentioned chloride of zinc solution, and the cauterization, if necessary, is repeated once in twenty-four hours. The uterus is washed out once a day with antiseptic fluid, and an iodoform pencil is left in it. This treatment is continued till all sloughs are thrown off. Quinine and alcohol should be prescribed with shorter intervals. At least twelve ounces of whiskey or brandy should be given in the twenty-four hours.

If there is any sign of weakening of the heart, digitalis should be given,—preferably the officinal infusion in half-ounce doses (15 grammes) four times a day; but if the patient cannot swallow or vomits, the tincture may be injected subcutaneously (♏v–x,—from 30 to 60 centigrammes,—repeated according to circumstances). Tinctura strophanthi (♏v or vi—30 or 35 centigrammes) is also useful. In more acute cases nitroglycerin (gr. $\frac{1}{100}$ to $\frac{1}{25}$—from $\frac{6}{10}$ to $2\frac{1}{2}$ milligrammes) and strychnine (gr. $\frac{1}{20}$ to $\frac{1}{10}$—from 3 to 6 milligrammes) are injected hypodermically.

In *dissecting metritis* the purulent discharge from the uterus should be combated and the expulsion of the detached portion favored by daily intra-uterine douches with creolin or lysol ($\frac{1}{2}$ of 1 per cent.), or the saturated solution of boric acid should be used. The fluid should always be warm, as cold injections into the uterus sometimes cause collapse.

Putrescence of the uterus has disappeared since the introduction of aseptic and antiseptic midwifery. If the writer met with a case, he would treat it with intra-uterine injections, iodoform suppositories, quinine, strychnine, digitalis, strophanthus, the largest doses of alcohol that could be borne, and nitrogenous food.

Since the uterus is the most common starting-point of general infection, and since it evidently is in the highest degree desirable to arrest the infection there, I shall here mention several other resources at our command.

Unguentum Credé is an ointment containing silver in a soluble form. From 30 to 45 grains (2–3 grammes) of it are rubbed once a day on places where the skin is particularly soft and free from hair, as, for instance, the inside of the arms or the thighs, the chest, or the abdomen. The active part of it is called *collargolum*, argentum solubile Credé, or argentum colloidale. It may also be used hypodermically, intravenously, by the mouth in capsule or solution, or it may be applied to wounds or placed in pill form in the uterine cavity or, at the end of laparotomy, in the peritoneal cavity. It enters the lymphatics and circulates dissolved in the blood. The inunction method has been in use for some years. The intravenous method has been recommended quite recently (1901). Any convenient and prominent vein may be employed. The most suitable is the left cephalic. The patient being in the recumbent position, the arm is allowed to hang down for a minute, and a bandage or ligature is firmly tied around it, after which the arm is permitted to hang down for one or two minutes longer. The skin is then disinfected and a hypodermic needle pushed into the vein. If the point is in the lumen of the vein, blood will flow. If it does not, the needle must be introduced again till it does. The syringe is then attached, the ligature around the arm is removed, and the solution is injected slowly and with frequent pauses. It is desirable to inject not less than 5 centigrammes (¾ grain) of collargolum in an adult. The collargolum is administered in a 1 per cent. or a ½ of 1 per cent. solution. A common hypodermic syringe would have to be refilled five times, which is inconvenient, and might lead to the displacement of the needle. It is, therefore, better to use a syringe holding not less than 10 grammes (ʒiiss).

If the vein cannot be made turgid, it must be laid free through a small incision in the skin. A fine probe-pointed silver canula, such as is found in my transfusion-apparatus (Fig. 421, p. 582), is introduced through a nick made with scissors in the vein. In order to prevent the tube from slipping out, a catgut ligature may be laid under the vein and tied behind the bulb of the tube. A syringe holding about 20 grammes (ʒv) is attached to the canula, and aspiration made, so as to suck out the air from the canula. Next, 10 to 20 grammes (ʒiiss to ʒv) of a ½ of 1 per cent. solution of collargolum is slowly pressed into the vein. The wound is closed with sutures or simply dressed as after phlebotomy. If the needle is thrust through the skin, the opening is covered with a piece of adhesive plaster. The usual amount injected is from 5 to 10 grammes (1¼ to 2½ drachms) of the stronger or 10 to 20 grammes (2½ to 5 drachms) of the weaker solution. The solution is made by simply shaking the collargolum with distilled water. It is decomposed by being rubbed in a mortar. The solution should stand quietly for a few minutes before using it, so that any undissolved or reprecipitated silver may settle to the bottom of the vessel, and the injection fluid is taken from the upper half of its contents.

In well-closed vessels the solution can be kept for many months. To test it a little is poured into distilled water. If the water remains clear and becomes brownish or olive-green in color, the fluid is in good condition; but if it becomes cloudy and silver-gray, the solution is unfit for use.

Not unfrequently a chilly feeling or a distinct chill with fever occurs from two to four hours after the injection, but it soon passes off and leaves not the slightest ill effect. The effect of the intravenous injection on the disease is much greater than that of inunction with the ointment. It may have to be repeated once or oftener on the following and subsequent days.[21] My limited personal experience with collargolum, both as ointment and applied by intravenous injection, has not given me satisfaction. It reduced temperature and there was no unpleasant effect, but the patients died.

Marmorek's antistreptococcic serum is a fluid obtained in a way similar to that by which antidiphtheritic serum is produced, but it has by far not proved so useful an invention. It has been extensively used, but the mortality in its wake has been so enormous that it seems to do positive harm. It has been condemned by the committee appointed by the American Gynæcological Society to report on it.[22] It is only a question whether the mortality which has followed its use was due to the fluid or to the curettage that preceded the injection.

On the other hand, *nuclein* seems to be a valuable addition to our resources for combating puerperal infection. This is a substance obtained from yeast. It is given hypodermically (♏x—60 centigrammes—twice a day, increasing by ♏v—30 centigrammes—daily) or by the mouth (ʒss to ʒi—from 2 to 4 grammes). These doses refer to the "nuclein solution" prepared by Park, Davis & Co. The use of nuclein is rational in so far as it produces an artificial leucocytosis, and we know that leucocytes are employed in the household of nature to engulf microbes and render them harmless. Nuclein has a good effect on the secretions, ulcers, and the general condition of the patient. It is apt to cause pain in the bones, especially the tibiæ, which disappears within a week; and in so serious a disease, where the patient's life is at stake, such a drawback cannot carry much weight.[23]

Hypodermoclysis is also well worth trying (see p. 581). By it a large amount of normal salt solution is pumped into the circulatory system and eliminated by the kidneys. Thus it constitutes, as it were, an internal bath, by which obnoxious substances are washed out of the tissues. By combining this method with large high enemas of salt solution or soapsuds, the effect is increased.

Instead of injecting the fluid under the skin it may be injected into a vein, which has a more prompt effect.

Atmocausis has been used in a successful case.[24] It is certainly an effective way of disinfecting the uterine cavity, and is not unlikely to arrest infection if applied early.

Hysterectomy has been performed with the aim of removing the source of the infection. If this operation is to help, it must be performed before the microbes have invaded the general system, or, sometimes, within a day or two after confinement. At that time it is, however, hardly possible to foretell whether septicæmia will develop or not, so that we may say that there is great danger that the operation either will be performed too early or too late. A patient should certainly not be mutilated if she can get well and retain her internal genitals for further functions; and when infection has once been generalized, so serious an operation, which always is accompanied by much shock, will hardly avert, and may even hasten a fatal issue. The writer's personal experience with hysterectomy for puerperal infection does not warrant him in recommending it, and it has been condemned by the above-mentioned committee.

Parametritis and Adenitis.—These localizations are treated with ice, hot douches, opium, and later the Priessnitz compress. If the resolution is unduly slow, the groin should be painted with tincture of iodine once a day and covered with a piece of lint soaked in this lotion:

℞ Acidi carbolici, ʒi (4 grammes);
Glycerini,
Aquæ, āā ℥iij (90 grammes).—M.

This prevents the skin from cracking, allows one to continue the use of the iodine, and favors its absorption.

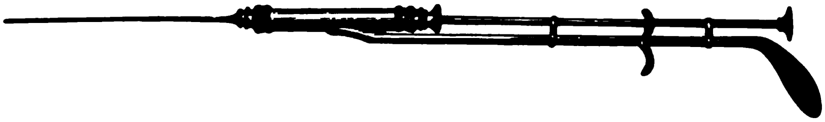
When the tenderness has subsided sufficiently to allow a speculum to be introduced, it is well to combine the painting of the skin with that of the vault of the vagina, which brings the iodine nearer to the affected part. This is repeated every three days. As tincture of iodine spreads far, and smarts in the vulva and on the skin, only very little should be used. It is best applied with a very small pledget of absorbent cotton, and the superfluous fluid should be wiped off before it trickles down into the sensitive region.

If suppuration occurs the ice-bag should be changed for a warm flaxseed-meal poultice, and when the abscess is formed it should be opened from the vagina or above Poupart's ligament or in both places. If there is any doubt about the presence of pus, an exploratory aspiration may be made through the vagina. For this purpose a common hypodermic syringe is too short. The writer has had one made with an attachment, which is quite convenient both for aspirations and injections into the tissues above the vagina (Fig. 490).

But to open an abscess in the broad ligament is not so simple a matter as to incise a felon. The operator has to keep clear of the ureter, the bladder, vaginal arteries, the uterine artery, and even the internal iliac.

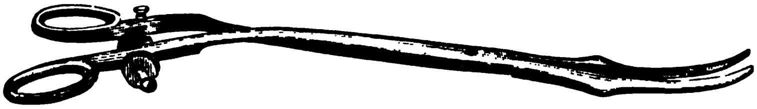
If the affection is unilateral an incision is made through the vaginal roof in a slanting direction backward and outward from the place where a transverse line drawn through the os strikes the side of the cervix. Next the connective tissue is separated with the finger and blunt instruments till the abscess is reached, when my blunt expanding perforator (Fig. 491) is thrust into it and opened to its full extent and withdrawn. The cavity is then washed out with plain sterilized water and a soft-rubber sky-rocket drainage-tube (Fig. 492) inserted and fastened to the lips of the opening in the vagina with four sutures. If the abscess is small it is enough to insert a double drainage-tube with cross-bar (Fig. 493). The afferent tube should be thinner than the efferent and without side holes. These tubes can easily be improvised by sewing pieces of rubber tubing together. They should be cut short a little outside of the vulva, so [illegible] cavity can be kept clean by daily injections with some anti-

Fig. 490.



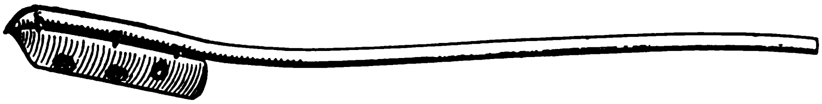
Exploratory vaginal aspirator.

Fig. 491.



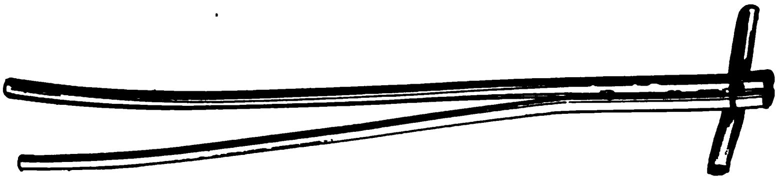
Garrigues's blunt expanding perforator.

Fig. 492.



Sky-rocket drainage-tube.

Fig. 493.



Double drainage-tube with cross-bar.

septic fluid, preferably tincture of iodine, a teaspoonful to a pint of lukewarm water.

If there are two abscesses, one on either side, it is better to make a transverse incision behind the cervix and open and drain them as just described. If the abscess is found in front between the uterus and the bladder, which is rare, the transverse incision is made in front of the cervix, keeping within the width of the cervix. The bladder is cautiously separated with the finger and the abscess opened with the blunt perforator.

If there is any hemorrhage, the cavity should be packed with iodoform gauze, and the drainage-tube inserted a day or two later.

The way of disinfecting the vagina has been described on p. 567.

As a rule, the opening and drainage of the abscess leads to recovery within a month; but if a fistulous tract remains, and suppuration undermines the patient's strength, her life may, perhaps, still be saved by vaginal hysterectomy with or without salpingo-oöphorectomy, but this is likely to be a difficult undertaking.

If the abscess points above Poupart's ligament, a large incision should be made above and parallel to the ligament, cutting layer by layer. When an opening has been made into the abscess cavity, a finger is inserted, counter-pressure made from the vagina, and if there is not too much intervening tissue, a counter-opening is made here, and a soft-rubber drainage-tube with side holes drawn through both openings.

If the suppuration has been allowed to spread widely, incisions may also be needed above the middle of the crest of the ilium,—at Petit's triangle,—and higher up on the back.

The internal treatment is the same as stated above.

Lymphangeitis and Lymphothrombosis.—The *external lymphangeitis* is treated with compresses dipped into a lead-and-opium wash:

℞ Tinct. opii, ℥ss (15 grammes);
Liq. plumbi subacetatis diluti, q. s. ad ℥viii (240 grammes).—M.
Sig.—For external use.

If suppuration occurs, the abscess is opened.

Lymphothrombosis of the uterus and the broad ligaments is treated, like the inflammations, with ice-bags, opiates, saline aperients, quinine, alcohol, and the special antiseptic remedies enumerated when treating of metritis.

Salpingitis and Oöphoritis.—If we infer from the persistent fever, the pain, the swelling, and the sensitiveness on pressure that abscesses have formed in the tubes and ovaries, we should give nature plenty of time to wall off the inflamed organs from the peritoneal cavity, and then they should be opened from the vagina as described for parametritis. The author has had most excellent results from this operation, opening as many as five pus collections, one being in Douglas's pouch and one in each tube and ovary. But he has also had failures through the eruption of general septicæmia.

According to Dr. Leon F. Garrigues,[25] the tube and ovary may be reached by separating the two layers of the broad ligament and punctured without opening the peritoneal cavity.

Abdominal salpingo-oöphorectomy should be performed only in those cases in which the appendages are situated so high up in the abdomen that they cannot be reached from the vagina. The prognosis is bad.

Peritonitis.—Opinions are much divided as to the advisability of using antiseptic intra-uterine injections in peritonitis. The author's practice is to give a copious one in the beginning of the disease, but not to repeat it. The idea is that besides the microbes that have already penetrated into the depth of the tissues there may be others on the surface of the uterus, which may be removed by a thorough washing-out. He has never seen any bad effect from this procedure and believes that sometimes it was beneficial.

The abdomen is covered with two large ice-bags, the weight of which may be diminished by suspending them to a cradle, or, what is preferable, with an ice-water coil. If cold is contraindicated (p. 731), a thin flaxseed-meal poultice or a flannel stupe should be substituted.

Opium is an invaluable remedy in peritonitis, which may be given in what would seem enormous doses. To give prompt relief a quarter of a grain of morphine is injected hypodermically at the beginning and followed by ⅛ or ¼ grain by the mouth every half hour, until the patient is fully under the influence of the drug,—that is to say, free from pain and yet not in deeper narcosis than that she can easily be aroused. The morphine may safely be given until the respiration is brought down to 14, 13, and even 12 per minute.

The author is well aware of the warning of Lawson Tait against opiates in peritonitis after gynæcological operations, and he follows his advice to move the bowels with saline aperients; but, in his opinion, this method should not be applied to puerperal peritonitis. When he was a student the treatment with senna was in vogue, and the recollection of the poor tortured women has left an indelible impression on his memory. Besides that, hardly any one survived. With the opium plan he has saved one-half of his patients affected with diffuse peritonitis, and if they die he has at least the satisfaction of rendering their condition comparatively comfortable.

If morphine has too depressing an effect, especially if the heart is weak, it may be combined with atropine:

℞ Atropinæ sulphatis, gr. ⅛ (8 milligrammes);
Solutionis morphinæ (Magendie), ʒii (8 grammes).—M.
Sig.—From four to eight minims, as prescribed.

This may be given in the same dose and repeated as the plain morphine solution.

Alcohol should likewise be given in very large doses—from half an ounce to an ounce of strong liquor—every two hours, or oftener. Quinine is given in the dose of five grains every four hours, which is the time it needs for elimination, so that the patient is kept steadily under its influence, without being overpowered by large single doses.

No aperient medicine is used. The bowels generally move spontaneously from time to time, and if they do not, an enema is given. A small amount of pure glycerin (ʒii–℥i—from 8 to 30 grammes) may be injected, or a quart of flaxseed-meal infusion with a tablespoonful of castor oil and a teaspoonful of oil of turpentine, or, best of all, an ox-gall enema (inspissated ox-gall, a teaspoonful, or fresh gall, a tablespoonful; glycerin and castor oil, a tablespoonful of each; table salt, a heaping teaspoonful; and flaxseed-meal tea, a tablespoonful to a quart, strained).

The injection of creosote alone or mixed with equal parts of camphorated oil, beginning with 8 minims (50 centigrammes) of creosote morning and evening and gradually increasing the dose till 45 minims (3 grammes) of creosote are given daily, has been much praised. It is injected deeply into the gluteal region or the muscles of the spine. The injection is, however, very painful, and has not had any appreciable effect in the writer's hands.

Occasionally the above-mentioned tonics for the heart and respiration are given. For the vomiting cocaine and hydrocyanic acid are the best remedies. The former is given hypodermically or by the mouth (gr. ¼ every 2 hours); the latter, by the mouth, according to this formula:

℞ Acidi hydrocyanici diluti, ʒss (2 grammes);
Acidi citrici,
Sodii bicarbonatis, āā ʒii (8 grammes);
Syrupi rubi idæi, ℥ss (15 grammes);
Aquæ destillatæ, q. s. ad ℥vi (180 grammes).—M.
Sig.—A tablespoonful every 1, 2, or 3 hours.

An ice-bag placed over the pit of the stomach is also useful.

The diet is strictly fluid, and consists only of beef tea, milk, and oatmeal gruel or farina. But, as it is quite important to feed the patient, the beef tea must not be water with a flavor of osmazome and without nourishing quality. Good beef tea may be obtained by pouring a pint of cold water mixed with one or two teaspoonfuls of dilute hydrochloric acid on a pound of minced lean beef of superior quality. It is left for an hour and a half and stirred about every quarter of an hour. Then it is put over the fire until it reaches the boiling-point, strained, and taken warm or cold, after addition of a little salt, two ounces at a time. Another way is to let the beef, the water, and the muriatic acid stand on ice, press it repeatedly with a wooden spoon, strain it, and keep it on ice. About two ounces should be given every two hours. If the patient vomits so large a bulk, the beef may be boiled in a closed bottle without any water, but immersed in a water-bath. Of this strong juice a few teaspoonfuls are given at a time. Strong beef juice may also be obtained by broiling a slice of beef and squeezing it in an apparatus made for that purpose and found in hardware stores. These home-made beef juices and beef teas are much to be preferred to the different extracts found on the market, and which chiefly contain creatinin and only little albuminoids.

To give an idea of the amount of morphine, alcohol, and food that may be taken, the author may mention that one of his patients who recovered consumed in twenty-three days 216 grains (14.4 grammes) of morphine, 228 ounces (6840 grammes) of whiskey, 1078 ounces (32,340 grammes) of milk, and 418 ounces (12,540 grammes) of beef tea, which makes an average of 9 grains (58 centigrammes) of morphine, 9½ ounces (285 grammes) of whiskey, 45 ounces (1350 grammes) of milk, and 7½ ounces (225 grammes) of beef tea in twenty-four hours. The greatest amount of morphine administered in one day was 13¾ grains (880 milligrammes).

No antipyretics should be prescribed. They only mask the condition and weaken the patient. The quinine is given only in small doses that have no influence on the temperature.

The best way of reducing temperature is by the external application of cold. In addition to the ice-bags or ice-coils on the abdomen an ice-cap may be laid on the head. Some are made particularly for this purpose in the shape of a helmet. It is refreshing to the patient to be washed all over the body with equal parts of alcohol and water, but it has little influence on the internal temperature. Real refrigeration may be obtained by Kibbee's fever-cot, the cold pack, or cold baths.

The *fever-cot* consists of a wooden frame with a network of cord, under which is a rubber sheet forming an inclined gutter. At the lower end is placed a pail. A folded blanket is laid over the netting to protect the skin against being cut by the cords, and a rubber-covered pillow is laid at the head of the cot. A folded sheet is laid from side to side over the middle of the cot, wide enough to reach from the patient's armpits to her trochanters. Her clothes are drawn up, and the legs are covered with woollen stockings and a blanket. Hot-water bottles may even be placed against the soles of her feet. The sheet is folded over her abdomen and chest, and water is poured gently over it with a pitcher. The water should at first be from 85° to 90° F., but is gradually made colder, down to 80° or even 75° F. This procedure is continued for a quarter of an hour, when the sheet is let down and the patient is covered up. At the end of each hour the aspersion may be repeated, if there is a new rise in temperature. The great advantage of this contrivance is that the patient need not be moved at all.

When the fever-cot is not obtainable, the *cold pack* may be substituted. For this purpose two beds should be prepared, each covered with sheet-rubber or oil-cloth and a blanket. Over the blanket is placed a sheet wrung out of cold water. The patient is placed on the sheet, which is folded over her from the neck down, except the feet. If circulation is bad, hot water bags or bottles may be placed against the soles of the feet. The patient may be covered with a blanket or two tucked in all around her body. After ten minutes she is removed to the other bed, where the same procedure is gone through. Five or six packs may be needed to reduce the temperature to the point desired.

If a bath-tub can be procured, it is preferable, for the *cold bath* does not necessitate so much handling. The patient may be immersed in the sheet of her bed into a bath slightly below blood-temperature. By withdrawing warm water and adding cold the temperature of the bath is gradually brought down to 80° F. It is advisable to give a tablespoonful of brandy immediately before the bath, and she should be carefully watched in the bath, and taken out at the slightest sign of collapse. If she stands it well, she may remain in it for fifteen or twenty minutes.

Laparotomy has been performed in several cases, the fluid and fibrinous clots turned out, the cavity washed out with normal salt solution and wiped with peroxide of hydrogen, and gauze-drains left for escape of gas or fluid, but the results have not been very encouraging.

If the peritonitis is due to rupture of an abscess, the abdomen should be opened at once, cleaned, and drained.

It has also been recommended to make a wide transverse *incision behind the uterus* and leave a Mikulicz tampon in the pelvis.

When the patient survives the acute stage and the exudation becomes encysted, the abscess should always be opened and drained in a way similar to that described for local peritonitis.

PLEURISY.—If the pleura becomes inflamed, an ice-bag should be applied to the chest; or, if cold is not well borne, or the seat of the inflammation is on the back, that side of the chest should be covered with a flaxseed-meal poultice or a piece of *spongiopiline*—a gutta-percha-covered sheet of felt, which only needs dipping into hot water and keeps nicely warm. *Antiphlogistine* might also be tried. It is a putty-like combination of glycerin, boric acid, salicylic acid, iron carbonate, peppermint, gaultheria, eucalyptus, iodine, and dehydrated silicate of aluminum and magnesium. It is warmed and smeared directly on the skin in a layer one-eighth inch thick, covered with a jacket of cheesecloth or bandage, and left in place for twenty-four hours before it is renewed. The last-named item is of importance to these poor patients, who, on account of the acute pain, shun being moved more than necessary.

In the exudative form of pleurisy, the skin over the affected part may be painted with tincture of iodine. Internally iodide of potassium and diuretics should be administered, for instance:

℞ Tritici repentis radicis decoctionis, ℥ss–℥viii (15–240 grammes);
Potassii acetatis,
Potassii bitartratis,
Potassii citratis, āā ʒi (4 grammes).—M.
Sig.—Shake well. A tablespoonful from four to six times a day.

The amount of fluid is rarely so large that thoracentesis is indicated. If the fluid becomes purulent (*empyema*), a piece of a rib should be excised, and the cavity washed out and drained.

Pneumonia.—When pneumonia develops, the above-mentioned warm applications should be made to the chest. Stimulants and heart tonics are highly called for. A favorite prescription of the writer is the following:

℞ Ammonii carbonatis, ʒii (8 grammes).
Div. in chart. No. xii.
Sig.—No. 1. One powder four times a day.

℞ Acidi citrici,
Sacchari albi, āā ʒii (8 grammes).
Div. in chart. No. xii.
Sig.—No. 2. One powder four times a day, mixed with No. 1.

Each powder is dissolved in one-third of a glassful of water, and the contents poured together and drunk while effervescing. Since the disease is known to be due to a specific microbe, the pneumococcus, creosotal—that is, carbonate of creosote—is much used. It is an internal antiseptic which is largely excreted through the breath; from ♏xv to ʒi (1–4 grammes) may be given in capsules four times a day.

Inhalation of oxygen may help the patient to ride out a storm.

Gravitation of blood to the lowest parts of the lungs should be avoided by frequent change in position. If œdema supervenes, dry cupping should be used on the chest in front and behind.

PERICARDITIS AND ENDOCARDITIS.—Pericarditis is treated like pleurisy.

Endocarditis is probably beyond our therapeutic resources, but ice-bags and the different heart tonics are to be prescribed, even if we do not expect much help from them.

ENTERITIS.—The inflammation of the mucous membrane of the intestine and the accompanying offensive diarrhœa are treated with internal disinfectants. Pure carbolic acid may be given :

℞ Acidi carbolici purissimi, ♏xvi (1 gramme) ;
Mucil. acaciæ,
Syrupi aurantii, āā ℥ss (15 grammes) ;
Aquæ dest., q. s. ad ℥viii (240 grammes).—M.
Sig.—A tablespoonful every hour.

It may be combined with liquor iodi compositus, in the same dose. Salol or salophen, gr. v (30 centigrammes) every two hours, and naphtalin, gr. ij–vii (from 10 to 35 centigrammes) every two hours, are also useful. Warm enemas with starch (a teaspoonful) and laudanum (25 drops) are very grateful when the patient suffers from tenesmus. The addition of a heaping teaspoonful of subnitrate of bismuth has a beneficial effect both as germicide and astringent.

HEPATITIS.—The inflammation of the liver is treated with an ice-bag or warm stupes and the internal administration of calomel.

NEPHRITIS.—When the kidneys are affected, a flaxseed-meal poultice or a quilted muslin bag containing digitalis leaves and dipped in hot water should be placed under the loin. Diuretics should be given (see PLEURISY). Small doses of chloral (gr. xv–xx—from 1 to 1.25 grammes—from one to three times a day) diminish the secretion of albumin. Tinctura ferri chloridi (♏xv–xx—from 1 to 1.25 grammes) is a tonic, astringent, and antiseptic. Warm baths have also a good effect.

If uræmic symptoms appear, elimination of the poison through the bowels and the skin should be favored. For this purpose drastic purgatives are used. Croton-oil (½ drop every half-hour, 2 drops in all) may be given in almond oil, bread-pill, or, if the patient cannot swallow, in butter rubbed on the tongue. Common elaterium is given in doses of ¼–½ grain (from 15 to 30 milligrammes) every hour; of Clutterbuck's elaterium ⅛ gr. (8 milligrammes), of elaterin $\frac{1}{16}$–$\frac{1}{12}$ grain (4–5 milligrammes), and of gamboge gr. i (6 centigrammes) every hour.

The best way of producing perspiration is with the hot-air bath. An alcohol lamp is placed under a chair, an open umbrella over the patient's abdomen, and a water-proof over both. But as perspiration is weakening, the patient should be watched, and at all events the bath should not be prolonged beyond two hours.

The diet should consist exclusively of milk in its natural state or peptonized, or fermented as kumiss or zoolac, all of which are given in frequent, small quantities. If even these are vomited, recourse must be had to rectal alimentation with Leube-Rosenthal's solution; Rudisch's beef-peptonoids; a mixture of four ounces of beef and one ounce of pancreas, which the butchers call "white liver," finely chopped and diluted with water until it can pass through a Davidson's syringe; or an egg beaten up with four ounces of milk, with or without the addition of an ounce of whiskey.

The troublesome vomiting is combated with cocaine, hydrocyanic acid, nux vomica, bismuth, creosote, carbolic acid, or tincture of iodine, internally, and ice or a warm turpentine stupe applied to the pit of the stomach.

ENCEPHALITIS AND MENINGITIS.—If the brain or its envelopes are affected, there is little hope of any therapeutical results. The head should be covered with an ice-cap. Ergot and liquor barii chloridi (♏ v—30 centigrammes) may be given every four hours with the aim of contracting the blood-vessels. Intravenous injection of collargolum might be tried in order to counteract the work of the microbes.

Delirium, *restlessness*, and *insomnia* are treated with bromides, chloral, cannabis indica, opiates, sulphonal, trional, hydrobromate of hyoscine, etc.

ARTHRITIS.—If a joint is affected, it should be immobilized by splints. In the beginning an ice-bag has often excellent effect. Later, tincture of iodine and fly-blisters may cause a valuable revulsion to the skin. If the fluid becomes purulent, it should be drawn out with an aspirator and the joint injected with carbolic acid (3 to 5 per cent.), creolin or lysol (2 per cent.), or peroxide of hydrogen, and if that does not check the inflammation, the joint must be opened with free incisions. During the after-treatment great care should be taken to move the joint so as to avoid ankylosis.

SKIN DISEASES.—The eruptions that appear on the skin hardly call for special treatment. If they itch, considerable relief may be afforded by washing them with this lotion:

℞ Acidi carbolici, ʒss (2 grammes);
Alcoholis,
Glycerini, āā ℥ss (15 grammes);
Aquæ, q. s. ad ℥vi (280 grammes).—M.

Bed-sores should be zealously avoided, and, if they appear, treated most carefully. As soon as the skin becomes red over the sacrum, the trochanters, the heels, or the shoulder-blades, soft pillows should be put under the threatened places. An inflatable rubber ring is placed under the breech. Large air-filled pessaries may be used to protect the heels, or rings may be made by winding a strip of muslin around a wad of cotton, wool, or oakum. The red spot should be bathed frequently with lead-water. The skin should not be rubbed, but a soft cloth pressed against it to dry it, and then it should be dusted with

℞ Zinci oxidi, ʒii (8 grammes);
Amyli, ℥ii (60 grammes).—M.

If an excoriation forms, it should be dressed with lint soaked in glycerite of tannin (ʒi to ℥i—4 grammes to 30 grammes), with zinc ointment, or the above-mentioned ointment with iodoform and balsam of Peru (p. 729).

If gangrene develops, the dead tissue should be cut away as soon as a line of demarcation is formed, and the sore should be covered with lint soaked in camphor emulsion:

℞ Camphoræ, ℥ss (15 grammes);
Mucilaginis acaciæ, ℥i (30 grammes);
Aquæ, q. s. ad ℥v (150 grammes).—M.
Sig.—Shake well. For external use.

When once the hole is filled by granulation, the above-named milder applications may be substituted.

In severe cases much benefit may be derived from placing the patient on a water mattress, which adapts itself perfectly to the body and facilitates all movements by the ease with which the water flows from one part to the other.

PHLEBITIS.—1. *Common phlebitis of the legs and phlegmasia alba dolens* are treated by raising the extremity, so as to favor reflux. The affected part should be painted once daily with tincture of iodine along the inflamed vein, covered with cotton batting, and slightly compressed with roller bandages. In protracted cases blue ointment may be substituted for the iodine, but as there is danger of loosening a thrombus, which would form an embolus, the ointment should be melted with oil and painted on the skin and not rubbed in. The severe pain in phlegmasia demands a free use of opiates. As there is great tendency to relapse, the patient should be kept in the recumbent position as much as two weeks after the swelling has subsided.

2. *Uterine phlebitis* calls for all the remedies mentioned above, especially vaginal douches, ice-bags or stupes, alcohol, quinine, heart tonics, internal antiseptics, hypodermoclysis, or venous injection of normal salt solution, and refrigerants. The different localizations must be followed up and treated as stated above.

With some obstetricians hysterectomy is more indicated when the diagnosis of uterine phlebitis can be made than in any other condition. As a rule, the operation can be performed from the vagina, which operation has a somewhat better prognosis than abdominal hysterectomy. With regard to the technique in the abdominal section the reader is referred to the above-described operation (p. 675).

The vaginal hysterectomy may be performed by the ligature or clamp method, preferably the latter, since it is more expeditious.[1]

Local abscesses should be opened and dressed, and subfascial suppuration demands several long and deep incisions and drainage.

ACUTEST SEPTICÆMIA.—In cases where the whole system is overwhelmed before localizations have time to form, it goes without saying that therapeutics are almost powerless. Still, the obstetrician will stand by his patient and do all he can to help her to resist the formidable onset of destructive agents, according to the principles laid down in the preceding pages, especially prescribing internal antiseptics, tonics, and stimulants. A French physician claims great success in such cases by the hypodermic injection of oil of turpentine in doses of ♏ xv (1 gramme). It forms an abscess, and may be repeated in several places.[26]

Looking back over the whole field and supplementing his own experience with a somewhat extended scrutiny of literary records, the author is of the opinion that puerperal infection is chiefly a medical disease, and that surgical interference probably has done more harm than good in trying to combat it. Both from America and from abroad we have reports of series of cases, in which bacteriological examination showed the presence of streptococci, which were only treated with stimulating and tonic drugs and nutritious food, and in which the mortality was only 4 per cent. or a fraction more.[27]

In the discussion referred to above on "puerperal fever," which took place at the meeting of the German Gynæcological Society in Berlin, in May, 1899, the different speakers also reported their mortality as being between 4 and 5 per cent., although they differed widely in treatment. This can then probably be looked upon as the inherent mortality with good medical treatment.

REFERENCES.

1. Kroenig, Centralbl. f. Gynäk., 1899, p. 697.
2. Burkhardt, ibid., p. 1274.
3. Koblanck, ibid., p. 1383.
4. Vahle, "Das bakteriologische Verhalten des Scheidensekrets Neugeborner," Zeitsch. f. Geburtshülfe und Gynäkol., vol. xxxii., No. 3.
5. Krönig, Centralbl. f. Gynäk., 1899, p. 679.
6. Oliver Wendell Holmes, "Contagiousness of Puerperal Fever," New England Quarterly Journal, 1843.
7. Robert P. Harris, Amer. Jour. Med. Sci., April, 1875, p. 474.

---

[1] Garrigues, Diseases of Women, third ed., pp. 510 and 513.

8. Siredey, Les Maladies puerpérales, Paris, 1884, p. 99.
9. Ibid., p. 98.
10. Fehling, Archiv f. Gynäk., 1888, vol. xxii. p. 433.
11. Gustav Braun, Centralbl. f. Gynäk., 1889, vol. xiii. p. 636.
12. Pallen, Trans. N. Y. Obst. Soc., 1876–1878, p. 78.
13. Depaul, De la Fièvre puerpérale, Paris, 1858, p. 31.
14. Bumm, Centralbl. f. Gynäk., 1899, vol. xiii. p. 723; C. Flügge, ibid., 1898, vol. xxii. p. 350.
15. Busch, Neue Zeitschrift f. Geburtskunde, vol. xxxii. No. 3.
16. Ahlfeld, Centralbl. f. Gynäk., 1899, p. 1195.
17. Czemetschka, ibid., 1895, p. 231.
18. Schenk, ibid., 1898, p. 980.
19. Lindenthal, ibid., 1899, p. 679.
20. Ahlfeld, Lehrbuch der Geburtshilfe, 2d ed., Leipsic, 1898, p. 551.
21. B. Credé, Die medicinische Woche, Berlin, May 28 and June 3, 1901.
22. Trans. Amer. Gynæcol. Soc., 1899, vol. xxiv. p. 104.
23. J. Hofbauer, Centralbl. f. Gynäk., 1896, No. 17, vol. xx. p. 441.
24. Oscar Beuttner, Centralbl. f. Gynäk., 1899, p. 995.
25. L. F. Garrigues, "A New Method for Retroperitoneal Drainage of Pyosalpinx," Medical News, May 26, 1900.
26. Thierry, Lyon médical, June 26, 1892.
27. J. Whitridge Williams, Trans. Amer. Gyn. Soc., 1899, vol. xxiv. p. 97.

CHAPTER II.

DISEASES OF THE UTERUS.

§ 1. **Subinvolution of the Uterus.**—Subinvolution means the condition in which the uterus after childbirth remains of larger size than normal.

We have seen (p. 228) that the uterus the day after confinement ordinarily is found somewhat and even as much as an inch above the umbilicus, and that it henceforth diminishes steadily and sinks down into the pelvis. The time that elapses before the uterus regains its normal depth varies from four to twelve weeks, and this process of involution occupies in most cases six to ten weeks. The depth of the uterus can only be measured with sounds, which has been done in the interest of science, but from which the practitioner should absolutely refrain. Practically we may say that involution progresses satisfactorily if the uterus within two weeks leaves the anterior wall of the abdomen and sinks down into the true pelvis. In most cases this takes nine days, and that is probably the origin of the routine practice of midwives and most physicians in keeping the patient in bed for that length of time, but I have seen involution in primiparæ progress thus far in five days. In judging of the height of the uterus, it is to be remembered that the fundus in the unimpregnated living woman normally reaches a little above the plane of the brim of the pelvis, which must not be confounded with a horizontal plane passing through the upper end of the symphysis when she stands.[1]

The immediate cause of the diminution in the size of the womb is muscular contraction, which presses out glycogen and blood from the wall of the uterus; and from the second day fatty degeneration, liquefaction, and absorption take place.

Anything that interferes with the contraction and retraction and the normal metabolism in the muscle-cells, any active congestion or passive stasis of blood, may therefore become a cause of subinvolution. There may be retention of lochia, a blood-clot, a piece of the placenta, or part of the membranes. There may be small fibroids interspersed in the muscular tissue of the uterus.

Women who do not nurse are more liable to subinvolution, the sucking of the child having a direct effect on uterine contractions. Women who lead a sedentary life, who do not use their muscles, who have flabby flesh, and who are anæmic are more likely to have a defective involution than those who have more active habits. The writer has called particular attention to the value of bicycling in developing the round ligaments of the uterus and thus preventing displacements and insuring the right direction of the fœtus towards the brim of the pelvis during labor.[2] Irregular tightening of the abdominal binder, an overfilled bladder, or a loaded intestine may interfere with the free circulation in the uterus. The same may in a more permanent and less remediable way be due to heart disease, liver complaint, or chronic kidney trouble. Premature getting up after childbirth is a common cause of subinvolution. The uterus at that time is large, heavy, flabby, anteverted, and anteflexed. All the surrounding parts destined to support it are distended, soft, and yielding. When the woman occupies a recumbent position, gravitation works favorably in counterbalancing these conditions; but when she resumes the sitting and erect posture, gravity works under the most favorable angle, namely, perpendicularly on the long axis of the uterus, getting a good purchase by taking hold of the enlarged body of the uterus, which forms the long arm of a lever, placed horizontally, while the cervix represents the short arm of the same, placed almost perpendicularly. Premature resumption of sexual intercourse determines a rush of blood to the internal genitals. The high forceps operation or version often retards involution. Narrowness of the pelvis may have the same effect, even if no operation has been performed. The decidua may grow unduly or a fibrinous polypus form on the placental site. The endometrium may become the site of both glandular and interstitial hypertrophy. Often a laceration of the cervix gives rise to inflammatory action in the parametrium. Peritonitic adhesions may mechanically prevent the involution. Retroversion and retroflexion always cause venous stasis.

---

[1] Garrigues, Diseases of Women, third ed., p. 54.

[2] Garrigues, "Woman and the Bicycle," The Forum, January, 1896.

In the course of time subinvolution leads to the formation of connective tissue in the uterus, which results in undue hardness, often produces the symptoms of chronic metritis, leaves the uterus in a weakened condition for future labors, and may even predispose to its rupture.

During the lying-in period the lochia remain red longer than normal or become red again after having been yellow.

Subinvolution need not be limited to the uterus. A similar defective return to normal conditions may be found in the ligaments, the vagina, or the abdominal wall, which all remain too large, soft, and flabby,—a condition which favors uterine displacements, prolapse of the vagina, enteroptosis, and digestive disturbances.

The *treatment* is chiefly directed against the cause, but should also be symptomatic. The patient should remain in bed until the uterus is properly reduced in size. If there is a retroversion or retroflexion, the uterus should be manually replaced and kept in position with a large Emmet or Thomas pessary, for which smaller ones are substituted later. In this case it is better to let the patient sit up part of the day. If there is lochiometra or a retained blood-clot, the uterus should be manually lifted and squeezed. A daily massage and faradization or the application of the galvanic current may also be beneficial under other circumstances. The binder should be well fitted to the abdomen, and sometimes a special pad may be inserted to advantage between it and the uterus. During the lying-in period the position of the uterus should be examined daily and any deviation obviated by postural treatment. If the mother has the baby in her own bed, she is likely to turn towards it, and the fundus will fall down on this side. If the bed stands with one side against a wall, the patient will turn out towards the room, and the uterus will fall that way. Orders must, therefore, be given every day how the patient shall lie.

If the patient cannot urinate, the urine should be drawn at intervals not exceeding six hours. After the first two days regular evacuation of the bowels should, if necessary, be insured by enemas and aperients. Large hot vaginal douches three times a day provoke the uterus to contraction. If the lochia remain red too long, I resume the use of ergot, or give a decoction of cottonroot bark.[1] Iron and alcohol are contraindicated, since they increase the bloody flow. As a tonic I use strychnine, which also has a direct effect on muscular contraction, mineral acids, and bark:

---

[1] Garrigues, "The Cottonroot Bark as a Uterine Hæmostatic," The Postgraduate, Jan. 1887, vol. ii., No. 2, p. 117.

℞ Acidi sulphurici diluti, ʒii (8 grammes);
Extr. cinchonæ co.,
Syr. aurantii, āā ℥ss (15 grammes);
Aquæ destillatæ, q. s. ad ℥viii (240 grammes).—M.
Sig.—Shake well. A tablespoonful four times a day.

If it is known that portions of placenta or membranes remain in the uterus, the patient should be anæsthetized, the cervix, if necessary, dilated, one or two fingers introduced into the cavity with counter-pressure from the outside, and the offending object removed. As to curettage, I do not deny that it occasionally may be very useful; but, as stated above, it is too dangerous shortly after delivery, so that it should only be employed under very pressing circumstances, or delayed till a period when all danger of puerperal infection is passed.

§ 2. **Superinvolution of the Uterus.**—Superinvolution is an abnormal atrophy of the uterus following childbirth. It is really more a gynæcological than an obstetrical disease, since it hardly will begin in the short period the woman remains in the hands of the obstetrician. But since atrophy often originates as a sequel of abortion or childbirth, we shall devote a few lines to it here.

In most cases the whole organ shrinks in all dimensions, but, occasionally, the depth of the uterine cavity may remain unchanged and the atrophy shows only in the great thinness and abnormal softness of the walls of the uterus.

Etiology.—It is by far not so common as subinvolution. It is somewhat more frequent after abortion than after childbirth. It is caused by loss of blood, protracted lactation, a rapid succession of pregnancies, debilitating diseases, such as scarlet fever, tuberculosis, chlorosis, syphilis, diabetes, Bright's disease, and exophthalmic goitre. Puerperal insanity is not rarely accompanied by it.

Symptoms.—It is characterized by amenorrhœa and secondary sterility. Some patients complain of sacral pain, headache, insomnia, mental depression, anorexia, indigestion, and general weakness.

As a rule, the canal is much shortened, but even if the sound enters to the normal depth, it is characteristic that the knob is felt with unusual distinctness through the abdominal wall.

The *prognosis* is in so far better in puerperal cases than when atrophy develops from other causes, as the condition, when of puerperal origin, sometimes is only transient.

Treatment.—If there is amenorrhœa, the practitioner should take care not to prescribe emmenagogues. The patient should have a rich albuminoid diet with strong red wine. If she nurses, the child should be weaned. The best local treatment consists in the application of the galvanic current, with the negative pole in the uterus. Besides, the patient should be given phosphorus, protonuclein, terraline, and bitter remedies.

§ 3. **Retention of Parts of the Placenta or Membranes.**—We have seen that the retention of parts of the after-birth, especially the placenta, may give rise to puerperal infection (p. 698). We have also met it as a cause of subinvolution (p. 748). It also gives rise to hemorrhage. That occurring immediately after labor has been discussed above (p. 509). But we may have hemorrhage from this cause occurring days or weeks after labor—so-called *secondary post-partum hemorrhage*. A large part of the placenta, even one-half of it, may be retained and expelled in the course of the first day without much hemorrhage, but most frequently there is serious or even fatal loss of blood. Smaller pieces may remain in the uterus for a week or two without causing any hemorrhage, but it is sure to follow earlier or later. Such retention may happen even when the placenta is expelled spontaneously, and it is not unlikely that it occurs oftener when it is expressed soon after the birth of the child. Sometimes the retained part is a placenta succenturiata, the membranes being torn off in its circumference. In other cases there may have been placentitis, which has caused an abnormally firm connection between the placenta and the uterus. A piece of placenta may remain and become covered with layers of fibrin, forming a so-called *placental polypus*. Rarely the nucleus is formed by the decidua alone, when the formation is called a *decidual*, or *fibrinous, polypus*.

These polypi are much more common after abortion than after delivery at term, and may then not make their appearance before weeks or months have elapsed.

At term labor may be accompanied by hemorrhage, or may be entirely normal, but within a week, or oftener two or three weeks, there follows a profuse hemorrhage, which may be repeated.

The *diagnosis* is not difficult, because the internal os, which generally closes within twelve days, remains open longer or reopens. By vaginal examination rarely a tumor is felt hanging down into the vagina. More frequently it is found inside of the external os, and still more commonly at the internal. When the uterus is being pressed well down, the finger can be carried all around the tumor, which is felt attached to the wall of the uterus.

The *prognosis* is good if the tumor is removed early. Otherwise it may give rise to dangerous hemorrhages or decomposition of the polypus, followed by septic endometritis or pyæmia.

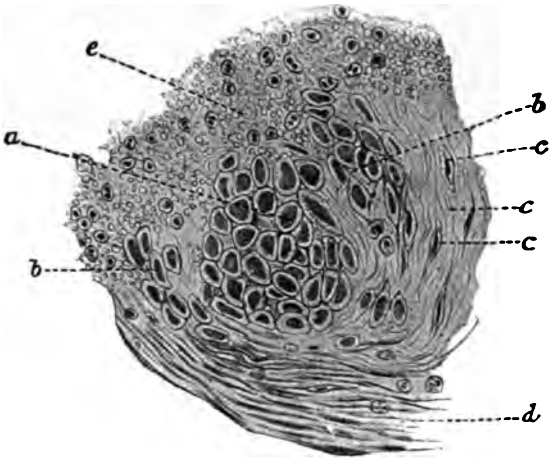
The *treatment* consists in the removal of the polypus, which in the beginning can be done by introducing a finger and pressing it against the pedicle. As a rule, the hemorrhage stops immediately. If it fails to do so, there are probably other masses which have to be removed. After the removal of the polypus the cavity should be washed out with an antiseptic fluid. If the case comes later under treatment it may be necessary to dilate the cervix and use the curette.

Retained decidua may also become a source of irritation, in consequence of which the new-formed endometrium becomes hyperplastic, a condition designated as *post-partum endometritis.*

In common cases of retention without formation of a polypus, the treatment is similar. A finger is introduced into the cavity of the uterus, which is pressed firmly down, and the remnant, be it of placenta or the ovum or hypertrophic decidua, scraped off with the nail, and then the uterus is washed out.

§ 4. **Malignant Tumor of Pregnancy.**—Not many years ago it was discovered that a malignant tumor is apt to appear in connection with pregnancy. Since then many cases have been published. The original case was described under the name of *deciduoma malignum* (Fig. 494), and the tumor was believed to be a kind of *sarcoma* developed from the decidua. In other cases it was found to be composed of syncytium and the epithelial cells of the villi of the chorion, and it was called *chorio-epithelioma malignum sive destruens*, for which later have been substituted *chorioma* and *syncytioma* (Fig. 495). In other cases, again, the development was shown to begin from the epithelium of the capillaries of the decidua, and it was declared to be an *endothelioma.* Some pathologists lay the chief stress upon the fetal ele-

FIG. 494.



Deciduoma malignum. (Sänger.) *a*, nest of decidual cells; *b*, another developing; *c*, intermuscular connective tissue; *d*, muscle-fibres; *e*, extravasated blood.

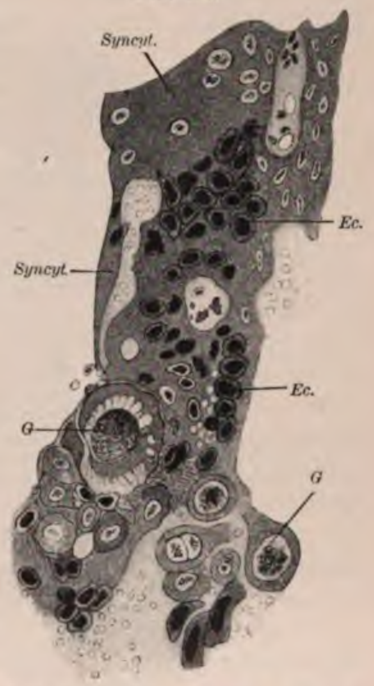
ments of the tumor and consequently look upon it as a disease of the ovum, while others take it to be a maternal disease. According to this latter view the patient had a fibrous sarcoma or an endothelioma before she became pregnant, and the admixture of fetal elements is only an accidental complication, which may take place or may not. The presence of syncytium is not enough to prove the fetal origin, because under the influence of pregnancy other cells, especially the epithelium of the uterine glands, may take a syncytial character.

However this may be, the fact remains that a malignant tumor sometimes forms or increases in the uterus in connection with pregnancy. Exceptionally it starts from the Fallopian tubes.

Etiology.—It is found in young women or in elderly ones who have often been pregnant. It may occur after labor at term or abortion, and is especially frequent after a vesicular mole.

Symptoms.—The disease appears, as a rule, within a few weeks or months after confinement, abortion, or the expulsion of a vesicular mole; rarely from two to four years later. It is characterized by repeated or continuous hemorrhage. The patient becomes pale, and loses strength and flesh. Nodules may appear in the vagina which exulcerate (Fig. 496). Even without that there may be an offensive discharge from the uterus, due to the breaking down of the tumor. The uterus is somewhat enlarged. Metastases may also form in the iliac fossa, in the gluteal region, the ileum, the liver, the spleen, the kidneys, the lungs, or the brain.

Fig. 495.

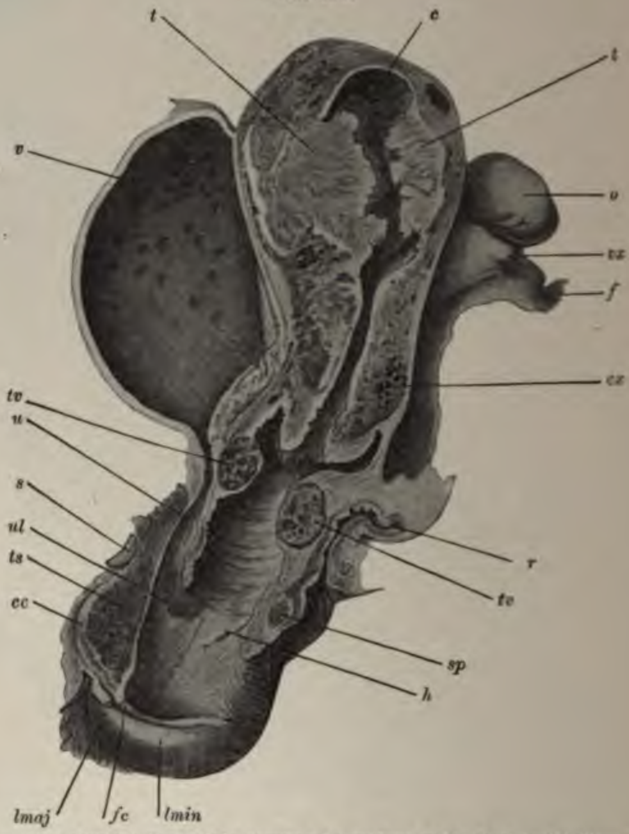


Chorio-epithelioma malignum. (Ulesco-Stroganowa.) *Syncyt.*, tissue consisting of syncytium; *Ec.*, ectoderma cells, or chorion epithelium; *G*, giant cells.

Prognosis.—If left to itself the disease ends fatally within six or seven months. On the other hand, if the uterus is extirpated the patient may recover, even after emboli have been carried to the lungs. This is, however, only possible if the emboli consist exclusively of villi of the chorion and do not contain sarcoma cells, saprophytes, or pathogenic microbes. By hysterectomy one-third of the patients affected with malignant tumor of pregnancy have been saved.

Diagnosis.—The repeated hemorrhage, the fetid discharge, the pallor of a patient who recently has given birth to a child or aborted or expelled a vesicular mole, and the enlargement of the uterus awaken the suspicion that a malignant tumor is developing in it. But the diagnosis can only be established by introducing the finger, feeling soft masses in the cavity of the uterus, scraping them off with the curette, and examining them microscopically. The cervical canal is sometimes sufficiently open to allow the insertion of a finger. If not, it must be dilated by coniform and expanding dilators (pp. 566, 567), or if, exceptionally, these do not give sufficient space for passing the finger, the cervix must be opened with laminaria tents, which are dis-

FIG. 496.



Sagittal section through the pelvic organs of a patient with chorio-epithelioma malignum. (Marchand.) *c*, cavity of the uterus; *t t*, malignant tumors in the body of the uterus; *v*, bladder; *o*, enlarged œdematous right ovary; *vx*, varicose tumor beside the ovary; *f*, fimbriæ; *cx*, cervix, infiltrated with blood; *r*, rectum; *tv*, *tv*, tumors in the vagina; *u*, urethra; *s*, symphysis pubis; *sp*, sphincter ani muscle; *ul*, ulceration at the meatus urinarius; *ts*, sanguineous tumor between the urethra and the pubic arch; *cc*, corpora cavernosa clitoridis; *h*, hymen; *fc*, frænum clitoridis; *lmaj*, labium majus; *lmin*, labium minus.

infected by soaking them for a minute or two in a boiling antiseptic fluid, forming them to suit the curvature of the cervical canal, and transferring them to cold fluid, when they at once become hard again. Immediately before introduction they are lubricated with corrosive-sublimate glycerin (1 : 1000). The patient is placed in Sims's position, the cervical portion is made visible with a Sims speculum, a lip of the cervix seized with bullet-forceps, and the tent pushed in with a dressing-forceps.

Treatment.—As soon as the diagnosis is made the uterus, tubes, and ovaries should be removed by vaginal hysterectomy, and also vaginal nodules cut out, if present.

§ 5. **Secondary Post-partum Hemorrhage.**—Secondary hemorrhage is in most cases due to the late detachment of retained parts of the placenta or membranes, and has been mentioned in connection with that condition. It may come also from subinvolution.

During the first few days of the puerperium hemorrhage may be caused by an overfilled bladder, which interferes with the contraction of the uterus. It may be caused also by emotions or too early getting up. Wounds in the cervix, vagina, or vulva may be torn open. A dangerous hemorrhage of this kind may occur if at the time of labor hemorrhage from deep vaginal tears was arrested by tamponade or suture.

Sometimes the cause of the hemorrhage is to be found in the detachment of thrombi from veins of the placental site. If this takes place in a case of puerperal infection with metrophlebitis, the loss of blood may be severe and dangerous.

Treatment.—In all cases of secondary hemorrhage the accoucheur should try to locate the source. Retained parts of the placenta and the membranes should be removed, as described above. An overfilled bladder should be emptied with catheter, and accumulated lochia squeezed out of the uterus. Reopened wounds may call for tamponing or suture. Bleeding from the interior of an empty uterus may be checked by large hot intra-uterine injections, faradism, ergot, adrenalin, or stypticin, but if necessary the uterus should be tamponed with iodoform gauze or plain sterile gauze. Under all circumstances the patient should be kept quietly in bed until all danger is passed. She should have a light, cool diet, and her bowels should be kept open with saline aperients.

Thrombus, or *hæmatoma*, of the vulva or vagina in the puerperium has been described in treating of ABNORMAL LABOR (p. 521).

§ 6. **Displacements.**—ANTEFLEXION.—We have seen above (p. 229) that immediately after delivery the uterus assumes a shape of marked *anteflexion*, which even doubtless is one of the means by which nature prevents post-partum hemorrhage. During several weeks this antedisplacement increases, especially during the sitting and erect positions, wherefore we have recommended that the patient should be kept lying in bed until the uterus has sunk down into the pelvic cavity. The physiological antedisplacement ceases gradually, and the uterus resumes its normal place and shape; but if the patient gets up too soon and exerts herself by physical labor, the normal involution may be interfered with and the uterus remain permanently enlarged and anteflexed. This will, however, first show itself after the lying-in period is finished, and belongs, therefore, rather to the domain of gynæcology.

The angle formed between the body and the neck of the womb may prevent a free outflow of the lochia, which accumulate in the uterus, and may become offensive. The decomposed blood may become partially reabsorbed, and give rise to fever and even to a chill—*sapræmic fever.* Under such circumstances the uterus should be lifted up and squeezed and the blood removed from the vagina by disinfecting injections.

Congenital anteflexion is a great impediment to conception, but if the woman becomes pregnant, the gradual elevation during the period of pregnancy has an excellent effect on the shape of the uterus. It is, in fact, the best treatment, and often results in a permanent cure.

RETROVERSION AND RETROFLEXION.—While anteflexion is normal after childbirth, any retrodisplacement—retroversion or retroflexion—is abnormal.

If the patient has had such a displacement before her pregnancy,—and it seems rather to facilitate than to impede conception,—it will nearly always be reproduced after a few weeks.

If the patient remains in bed for weeks, mere gravity is apt to cause the uterus to fall backward; and when once it is retroverted, the pressure of the abdominal organs, impinging on the anterior wall of the uterus instead of on the posterior, will gradually bend the organ, so as to change the retroversion into a retroflexion. Retroflexion has been found as early as the end of the first week. A too large pelvis, premature labor, or abortion favors the development of retroflexion.

Retroversion and retroflexion always interfere with the normal circulation in the uterus. Quite commonly the lochia therefore become red again. Retrodisplacement leads also to lochiometra and subinvolution, and should, therefore, always be treated as soon as discovered. It is so much more desirable to make the discovery at an early date, as the lying-in period, when all the tissues are soft and flexible, is the very best time for successful treatment of the retrodisplacement.

Treatment.—Those who had a retroflexion before their pregnancy should not lie on their back, but on the side and in a semi-prone position.

When the uterus falls back, the patient should be placed in Sims's position. The physician, standing behind her, introduces the index and middle finger of the right hand, with the dorsal surface turned forward, and pressure is exercised on the corpus uteri upward and forward. The reposition is often facilitated by directing the pressure towards one of the iliosacral articulations, where there is more space. If the fingers are not long enough, a cotton ball held in a pair of curved forceps may be substituted. After the replacement is accomplished, the woman should remain in a semi-prone posture. As a rule, it is better to introduce a large Albert Smith pessary in order to retain the uterus in place. Ergot or one of the preparations made from it is given with a view of causing the uterus to contract in the position into which it has been brought manually.

LATEROFLEXION.—During involution the uterus may also become bent laterally. This depends exclusively on the posture, and can easily be avoided by following the above-mentioned practice of feeling for the fundus every day and giving the puerpera directions how she shall lie.

PROLAPSE OF THE UTERUS AND THE VAGINA.—When the uterus is displaced backward, it no longer forms an angle with the vagina, but lies with its long axis in the continuation of that hollow organ, and will by mere gravity sink down into it. This movement is facilitated by the relaxation of the tissues that normally hold the uterus back, especially the sacro-uterine ligaments, and by the lack of support from below. The vagina and vulva have been overstretched, and, perhaps, torn by the passage of the child. At the same time there is often subinvolution of the vaginal wall, which makes it soft and heavy. The surrounding connective tissue has lost its elasticity and become yielding. The anterior wall sustains the pressure of the full bladder; the posterior is pushed forward and downward by fæces distending the rectum. Thus both the anterior and the posterior wall bulge into the vagina and out through its entrance. The lower part of the vagina is invaginated and exercises a traction on the upper part and on the uterus, adding another factor to the mechanism by which it descends and prolapses.

Through an exertion the prolapse may also form suddenly, but the slow development is more common.

During pregnancy a prolapsed uterus is carried upward by its increased size and no longer finds room in the pelvis, but after delivery the prolapse is in most cases more pronounced than before. It can only be improved if through inflammatory disease the uterus has been suspended by peritoneal adhesions, or the vagina has been so narrowed by cicatrices that the uterus can no longer pass it.

Minor degrees of prolapse may be ameliorated by astringents used in vaginal injections or on tampons. The uterus should be replaced and the patient occupy a semi-prone position. Later it should be held up by a supporter, or after complete involution fastened in an operative way [1] or removed.

ELEVATION.—The puerperal uterus may be lifted abnormally by a full bladder. The patient should then be told to urinate frequently, or, if she is unable to do so, the urine should be drawn four times a day or oftener, according to the desire felt by the patient.

FLOATING KIDNEY.—Childbirth is the chief cause of movable or floating kidney, a condition which should be treated with a proper bandage during the puerperium and later removed by nephropexy.

CHAPTER III.

FIBROIDS OF THE ABDOMINAL WALL.

SOMETIMES fibroids develop in the abdominal wall after childbirth and in consequence of it. The development begins in the latter part of the puerperium or still later. Probably tears in the connective tissue or muscle substance, or, perhaps, the mere process of involution and regeneration, furnishes the impetus to the formation of this benign growth, which is composed of elements kindred to the tissue in which the tumor originates.

There is only one treatment applicable to these tumors,—their operative removal,—which sometimes can be accomplished without opening the peritoneal cavity. In other cases it is necessary to excise a portion of peritoneum together with the tumor.

CHAPTER IV.

DISEASES OF THE BREASTS.[2]

Anomalous Milk Secretion.—In rare cases there is no secretion of milk, a condition called *agalactia*. In other rare cases the secretion is so abundant that the loss of substance affects the health of the puerpera. This is called *polygalactia*. Another and not uncommon abnormality is *galactorrhœa*. In women thus affected the milk flows out all the time, even when the child does not suckle. Often this is combined with polygalactia, but it is also found independently. It is bad both for mother and child. The mother has the discomfort of having her clothes wet all the time. She is apt to catch cold. She becomes anæmic and weak, and complains of headache and backache. She may even become blind or insane. The great loss of substance predisposes her to tuberculosis. Sometimes severe uterine hemorrhages occur and aggravate the anæmia.

---

[1] Garrigues, Diseases of Women, third ed., pp. 480–485.

[2] Garrigues, "Inflammation of the Breasts and Allied Diseases connected with Childbirth," American System of Obstetrics, edited by Hirst, Philadelphia, 1889, Lea Brothers, vol. ii. pp. 379–400.

Too protracted lactation or lactation by a woman who has only little milk or who is weak and anæmic from other causes has a similar effect.

Galactorrhœa may sometimes be limited by compression of the breasts. Potassium iodide given internally may also diminish hypersecretion. Sometimes a diversion to the uterus checks the flow from the breasts. For this purpose the vaginal portion may be scarified, or leeches may be applied to it, or an intra-uterine electrode may be connected with the negative pole of a galvanic battery.[1] If nothing avails, and the mother's constitution suffers under the loss of milk, lactation must be discontinued. The same is, of course, the remedy for the consequences of protracted lactation, to which the women of the lower class are prone in order to avoid a new pregnancy, and of lactation in sickly women. Besides thus removing the drain on the mother, she should be strengthened by a nourishing diet, wine, chalybeates, arsenic, phosphorus, strychnine, and red bone marrow.

For the babe galactorrhœa is in so far a serious matter as all its nourishment may flow out, wetting the mother's clothes and bed, and nothing may be left for it. In such a case recourse must be had to a wet-nurse or artificial nursing.

Not infrequently the milk becomes deteriorated and unfit to nourish the child long before the regular period of weaning arrives. The milk becomes thin, often of a greenish color, and under the microscope shows by far not so closely packed fat-globules as does healthy milk (Fig. 237, p. 233). They are also uneven in size and distribution (Figs. 497, 498).

In the higher classes we find quite frequently that the women can nurse their children for only a few months. When the milk supply is deficient, but the milk otherwise is good and the mother well, she may continue to give her child what she has and supplement it with some artificial food. In such a case it is advisable to let her nurse the child three or four times in the daytime and rest at night.

The milk secretion diminishes if the mother has diarrhœa or fever, and may temporarily stop under the influence of emotions.

We may try to increase the milk supply by giving the patient much fluid food. The author is in the habit of ordering a cup of milk, tea, coffee, chocolate, cocoa, chicken broth, clam broth, beef tea, oatmeal or farina gruel to be given every two hours.

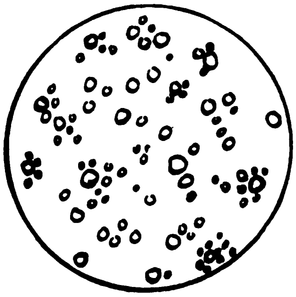
---

[1] Garrigues, Diseases of Women, third ed., p. 249.

Wet-nurses should be kept on the diet they are accustomed to, as a sudden change is apt to diminish the production of milk. Beer undoubtedly contributes to the secretion, and is much relished by nursing women, but sometimes causes diarrhœa in the child.

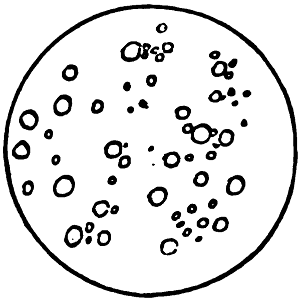
There is a proprietary medicine called *nutrolactis*, which is claimed to increase the flow of milk, but some patients complain that it nauseates them. If the lack of milk is due to atrophy of the mammary glands, there is no help for it.

FIG. 497.



Milk of anæmic woman. (Louis Fischer.)

FIG. 498.



Milk of woman fifteen months after childbirth. (Louis Fischer.)

Three or four days after delivery, in pluriparæ usually a day earlier, the breasts swell, become hard, red, and painful. There is a more abundant secretion of milk than the child can digest, or sometimes the milk does not flow easily through the nipple, or the child has not yet learned how to draw it out. Under these circumstances there is an accumulation of milk in the mother's breast called *galactostasis*. There is often a slight rise in temperature, known as *milk fever*, but it does not rise beyond 100.5° F., and, as a rule, disappears within twenty-four hours. A higher temperature is always pathological and requires investigation.

The above-described waist (p. 239) gives the woman great comfort.

As a rule, women do not menstruate during lactation. If they do, the child mostly becomes a little fretful during the period, but otherwise sustains no harm, and the mother may continue to nurse. If menstruation sets in and then stops again, it is usually the effect of a new pregnancy. As soon as this is diagnosticated, the child should be weaned, both in its own interest and in the mother's. The milk becomes less nourishing, and the drain on the mother in nourishing two children, one with her milk and one with her blood, is injurious.

§ 2. **Sore Nipples.**—During lactation the nipples very frequently become diseased. We must distinguish superficial *excoriations*, which occupy more or less of the tip, and *fissures*, which are deeper linear ulcers. Near the tip they are longitudinal and more or less radial, but near the base they are transverse, and may become so extended that the nipple adheres to the breast by the milk-ducts only, or even is completely torn off.

The excoriation often turns into a plain granulating *ulcer*, but if a wet-nurse nurses a syphilitic child a *chancre* may form on the nipple. This organ may also be the seat of *eczema*.

Etiology.—Predisposing causes of sore nipples are a thin epithelium and short nipples. If the nipples are not kept clean during pregnancy, drops of milk trickling out from the lactiferous ducts form together with old epidermal cells a scab, under which the epidermis atrophies and becomes excessively vulnerable. Stiff corsets that press on the nipples have a similar effect, and interfere with their normal growth, by which nature prepares them for the function they are destined to perform. When the nipples are too short the child is obliged to pull with much greater force in order to obtain the nourishment to which it is entitled, and consequently the nipple is more apt to suffer. To the predisposing causes may also be reckoned that the epithelium, being bathed in milk during the act of suckling, becomes macerated and loses its power of resistance.

The direct cause is the mechanical injury sustained by the licking and suction of the child, which tears the epithelium.

The cause of the fissures is to be sought in the normal folds found on the top and at the base of the nipple.

Suppurating nipples abound in staphylococci and among them the pus-producing *staphylococcus pyogenes aureus* and *albus*. The *streptococcus pyogenes* is much rarer. In the beginning there is also *oïdium lactis*, which is said to be identical with oïdium albicans, the fungus which causes the sprue in the mouth of sucklings. Some think the sprue precedes and causes the sore nipples; but since these are much more common than sprue, the converse is more likely to be the relation between cause and effect, the sprue being due to the oïdium sucked in from the nipple.

Eczema is chiefly due to lack of cleanliness, but I have also seen it in women who were particular about their person.

Excoriations, and, still more, fissures, cause a pain that may take such proportions that lactation becomes a torture. The patient may lose her appetite and become melancholy and nervous. Her pain may be such that she cries out when the child pulls, and that the interval is filled with dread of the next application of the child to her wounded breast.

A simple excoriation does not give rise to fever, but ulcers, especially fissures, may cause a temperature of 104° F. The flat excoriations heal in shorter time, but, since new ones may form, the whole process often takes several weeks. The fissures are still more slow to heal. Sore nipples may lead to mastitis, and contain, therefore, apart from their painfulness, an element of danger. Consequently we should try to prevent or cure them.

Treatment.—Preventive treatment should begin during pregnancy. The nipples should be kept clean with soap and water. Furthermore, they should, during the last two or three months, be washed daily with some spirituous or astringent fluid, such as brandy or whiskey, alcohol mixed with equal parts of water, cologne, or glycerite of tannin.

If there are scabs on the nipples, they ought to be softened and removed. A good remedy for this purpose is lead-water mixed with equal parts of thin oatmeal gruel. Pledgets of absorbent cotton or pieces of absorbent lint are soaked with this fluid, applied to the nipple, and covered with gutta-percha tissue.

Short nipples may be elongated by cautiously pulling on them for a minute or two every day. In a person suffering from habitual abortion this should, however, not be done, as, on account of the connection between the breasts and the uterus, pulling on the nipples provokes uterine contractions.

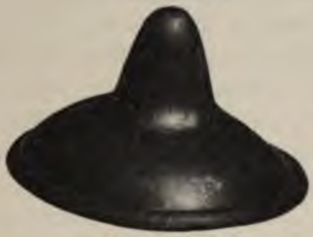
During the latter half of pregnancy women ought to abandon their cherished corset and wear only a soft waist that cannot exercise any injurious pressure on the nipples.

For the curative treatment of sore nipples we have about as long a list of remedies as for seasickness, a bad sign, which shows that none have proved to be of marked efficacy. My routine treatment in Maternity Hospital was to dust the sore with dry tannin and to cover it with a small circular piece of lint soaked in glycerin or smeared with vaseline. Outside of this came a piece of gutta-percha tissue, and the whole was kept in place with the above-described waist. Very often the sore heals under this treatment, without interrupting the nursing; and, since we were absolutely free from mammary abscesses, I think it has considerable value.

If the sore is large or deep and the pain great, it is necessary to discontinue nursing for a shorter or longer period,—in bad cases as much as four days,—and relieve the breasts by milking them with the fingers, much in the fashion the milkmaid milks her cow. In so doing the nurse carefully avoids touching the sore places. This is preferable to the kneading of the breast and to the use of the breast-pump. The latter tears the sores open and exercises a painful and injurious pressure in its circumference, and both procedures rather promote than prevent mastitis.

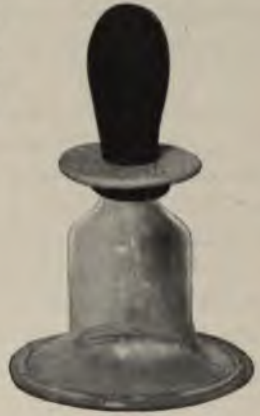
A soft-rubber shield (Fig. 499) placed over the areola during nursing in many cases offers great comfort. It is held with the fingers against the breast, and the milk is sucked out by the baby through fine openings; but sometimes no amount of coaxing can prevail upon the child to pull on the short nipple. Then another nipple-shield (Fig. 500) may be tried, which consists of a glass cup covering the nipple and a large soft-rubber nipple which fits well in the child's mouth. All such shields should be washed scrupulously and, when not in use, kept in a saturated solution of boric acid.

FIG. 499.



Nipple-shield.

FIG. 500.



Nipple-shield.

Led by the marvellous effect chloral hydrate has on anal fissures, I tried this drug also on sore nipples and found it very satisfactory. The nipple is dressed with a four per cent. solution on absorbent lint. Another drug that has been useful in my hands is orthoform:

℞ Orthoformi, ʒi (4 grammes);
Lanolini, ℥i (30 grammes).—M.
Sig.—For external use.

For the dry treatment dermatol may be used instead of tannin. Ichthyol may take the place of orthoform:

℞ Ichthyol., ʒi (4 grammes);
Lanolini, ʒiss (6 grammes);
Glycerini, flʒiss (6 grammes);
Ol. olivarum, ℥iiss (75 grammes).

Carbolic acid in 3 per cent. solution may be used on compresses. Nitrate of silver, 5 per cent., may be painted on the nipple with a camel's-hair brush once a day. White vaseline in tubes is in some cases as good as anything. Small rubber ice-bags (a condom or "two-finger protector") relieve pain and combat inflammation.

Whatever is done, the nipple and the child's mouth should be washed out with sterilized water before and after each nursing.

If granulating ulcers resist the milder means enumerated above, they should be touched with lunar caustic. If the sores will not heal and the patient's general health suffers, it may become necessary for her to give up nursing altogether, when the nipples heal in a short time.

Syphilitic ulcers call for the local and general treatment usual in that disease. If the ulcer is caused by the bite and sucking of the child, nothing is gained by weaning it; but if the chancre is produced in any other way, the child should at once be removed from the nurse and undergo specific treatment. If the child nurses its own mother and a syphilitic ulcer appears on her nipple, the child need not be weaned, for the milk cannot add to the harm done by the blood from which the child's body has been built up, unless the syphilis has been acquired after the birth of the child. Then it ought to be weaned at once.

Eczema is treated with the above-mentioned mixture of lead-water and oatmeal gruel, followed by an ointment:

℞ Plumbi oxidi, ʒii (8 grammes);
Ol. olivarum, ʒvi (24 grammes);
Aquæ, ℥i (30 grammes).—M.
Boil to the consistency of thick cream.

Still later the nipple is dusted with—

℞ Zinci oxidi, ʒi (4 grammes);
Amyli, ℥i (30 grammes).—M.

If there is much itching, camphor, ʒi (4 grammes), may be added, or, if the skin is healed, a lotion with carbolic acid may be substituted (p. 744).

§ 3. **Deep Inflammation of the Nipples.**—In rare cases the interior of the nipple becomes inflamed, the seat of the inflammation being either the lactiferous ducts or the interstitial connective tissue. Both may end in resolution or in suppuration.

In the inflammation of the ducts the nipple is moderately swollen, and small abscesses may form in the interior, which contain a milky pus. This sometimes dribbles from the apex, and, as it is
allowed by the child, the affection is serious.

In the interstitial form there are more swelling and greater
The pus is thick like cream, but, since it is not likely to be
by the child, this variety is less dangerous. It forms a glob-
, which breaks through or is opened on the side of the
soon closes. In both kinds the pain may become so great
has to be given up.

Treatment.—Lactation must be discontinued. Resolution may for a few days be furthered by the application of a small ice-bag; but if suppuration is inevitable it is hastened by the application of a warm poultice. In the inflammation of the ducts nothing more can be done; in that of the connective tissue the abscess should be opened with the knife as soon as it is formed, and dressed with gauze wrung out of creolin, lysol, or carbolic acid (1 per cent.) or impregnated with iodoform.

§ 4. **Eczema of the Areola.**—The areola, as well as the nipple, may become the seat of eczema, characterized by itching and the formation of vesicles, pustules, and small yellow or brown scabs. This condition is independent of eczema in the rest of the body. It may resist treatment for some time. The treatment is the same as that described for eczematous nipples.

§ 5. **Cellulitis and Adenitis of the Areola.**—The connective tissue underlying the areola and the glands protruding on its surface may become inflamed and form small abscesses. This is due chiefly to the child's attempts to suck from too short nipples or is a sequel of sore nipples. The skin becomes red and there are pain and fever. Small sensitive lumps are developed, and, if suppuration sets in, a yellow spot appears in the centre of the nodules. One or more openings perforate the skin and form a deep ulcer, followed by an irregular scar or a hard nodule, slow to disappear.

Treatment.—The prophylaxis consists in attention to the nipples. Short nipples should be pulled out with the fingers or a breast-pump each time before the child nurses. Sore nipples should be treated at their first appearance as described above. When abscesses form, they should be opened at once and dressed antiseptically, when they promptly heal.

§ 6. **Erysipelas of the Breasts.**—Before the introduction of the antiseptic treatment in Maternity Hospital, erysipelas of the breasts was not a rare occurrence; and I have even seen it spread over the whole body and end fatally. It starts from sore nipples or a mammary abscess and is due to a specific microbe, *streptococcus erysipelatis.*

The skin becomes dark red and hot, swollen, tender on pressure, and is separated from the healthy portion by a distinct line of demarcation. The pulse becomes rapid, temperature runs high, there are often digestive disturbances, and the patient complains of thirst. In general the disease ends in desquamation, but it may also become bullous, phlegmonous, or gangrenous.

Treatment.—Nursing with the affected breast, or in bad cases with both, must be interrupted, at least temporarily. Tinctura ferri chloridi (♏xx—120 centigrammes) should be given every two hours. The affected part and an inch all around it should be painted with undiluted creolin twice a day. Beta-naphtol mixed with vaseline (gr. xxv to ℥i—160 centigrammes to 30 grammes) rubbed into the skin is also good. Liquor gutta-perchæ forms an air-tight pellicle, which seems to kill the microbe. Compresses soaked in carbolized ice-water (from 1 to 2 per cent.) and changed frequently afford a pleasant sensation of refrigeration. Bullæ should be opened and dusted with iodoform or dressed with iodoform vaseline (ʒi to ℥i—4 to 30 grammes). In the gangrenous form dead tissue should be cut away with knife or scissors, and the wound dressed with camphor emulsion (p. 745).

§ 7. **Lymphangeitis of the Breasts.**—The breasts have two layers of lymphatics, a superficial and a deep. The superficial, or subcutaneous, consists of a delicate meshwork of vessels limited to the areola and the nipple. The deep, or glandular, layer surrounds the lobes and lobules of the mammary gland. Trunks start from the posterior surface and from the interior of the gland and go to the areola, where they form a plexus of very large vessels. From the areola two or three voluminous trunks carry the lymph to the axillary glands.

These latter trunks in rare instances become inflamed and are visible as pink streaks extending from the nipple to the axilla. The patient becomes feverish and complains of pain. As a rule, the disease ends in resolution and lasts only a few days. But it may end also in suppuration, forming small superficial abscesses.

This inflammation is due to the infection of sore nipples.

Treatment.—The breasts should be lifted and evenly compressed with the above-described waist (p. 236). Outside is placed an ice-bag, which is held in place by a piece of muslin pinned around the chest, and in which a hole is made for the metal cap of the bag. Nursing from the affected breast should be interrupted, but may be resumed when the disease has run its course. Abscesses should be laid open and dressed antiseptically.

It is not unlikely that there may be a similar affection in the depth of the gland, but that becomes merged in the inflammation of the connective tissue, which presently will be considered.

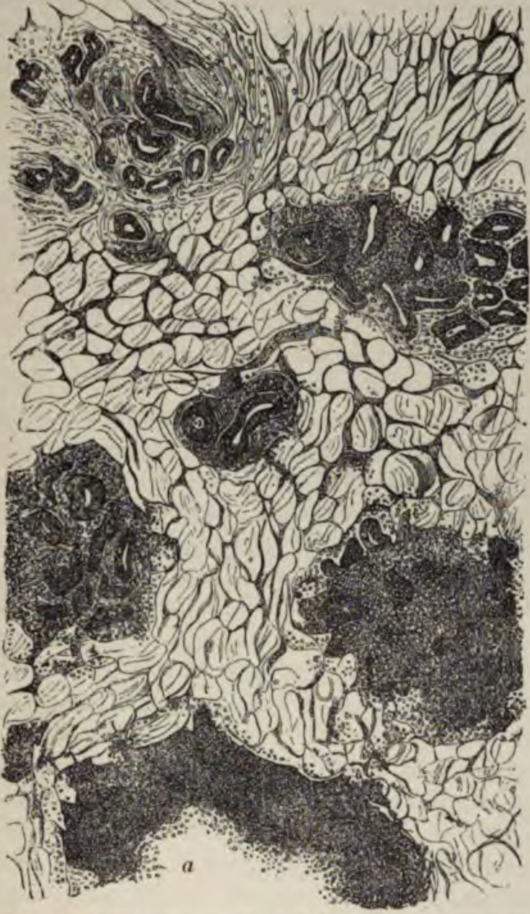
§ 8. **Mastitis.**—Mastitis, or inflammation of the breast, is sometimes designated by the Scotch word a *weed.*

According to its seat, above, in, or below the mammary gland, three varieties are distinguished—the *subcutaneous*, the *glandular*, and the *subglandular*, of which the glandular is by far the most frequent.

The *subcutaneous variety* is situated in the connective tissue between the skin and the gland, and may, like cellulitis in other parts of the body, be *circumscribed* or *diffuse*. In the *circumscribed* form one or more points of the skin become red and swollen, and fluctuation is soon established. The *diffuse* form usually begins as erysipelas. It may break through the skin in many points. Long shreds of connective tissue may be pulled out, and finally a large ulcer forms, at the bottom of which lies the denuded gland. This is a dangerous but fortunately rare disease.

In the *glandular variety* the seat of the inflammation is deeper and surrounds the acini (Fig. 501). During lactation the cuboidal epithelium of the acini (Fig. 236, p. 232) melts, forms fat-globules, and takes no part in the inflammation, which begins in the interacinous connective tissue, just outside of the acini; but when an abscess forms it may break into the acini and the finer milk-ducts.

Fig. 501.



Puerperal mastitis forming abscess. (Billroth.) *a*, group of acini melted to pus.

In the *subglandular variety* the inflammation takes place in the loose connective tissue between the gland and the thorax. Sometimes an abscess here communicates with a subcutaneous one through a canal in the mammary substance—*collar-button abscess.*

The right breast is more often affected with mastitis than the left. Sometimes both become inflamed.

Etiology.—Mastitis is nearly exclusively found in women who nurse. A woman who does not make any attempt at nursing is almost safe from the attacks of this disease. This goes far to show that nursing has something to do with the appearance of the disease. On the other hand, if a woman begins to nurse and gives it up after the milk secretion is well established, she is more apt to get a mastitis than if she had not begun. It has been observed during pregnancy, and could then be explained by lack of cleanliness.

The inflammation is ascribed to microbes,—staphylococci and streptococci or schizomycetes; but even the first drops of milk that come from the breasts of a woman in perfect health, as a rule, contain these microbes, especially the *staphylococcus aureus.* It is therefore necessary to look for other causes besides the microbes, which undoubtedly are the direct cause of the suppuration.

The laity usually ascribes the disease to refrigeration; but, if even occasionally exposure may aid to its development, the fact that it is found independently of season and climate shows that this cause can have only little influence on its production.

Sore nipples, on the other hand, have undoubtedly much to do with its appearance. At least an abrasion and often deep fissures are found in nearly every case; or if, exceptionally, they are not, they may have been overlooked and healed before the breast becomes inflamed. This supposition fits well with the seat of the inflammation, which, as we have seen, is in the connective tissue. In the denuded part of the nipple the spaces between the threads of the connective tissue lie open, and the microbes can easily find their way through the meshes to the deeper parts. They may also go through the lactiferous ducts, although they then must mount against the current.

Stagnation of milk is another, and, in my opinion, most potent factor in the production of the inflammation. This is borne out by the observation that it often is preceded by a general or partial swelling of the breast, which is relieved by emptying the ducts. This theory is also corroborated by the frequency of mammary abscess in women who suddenly stop nursing, although they have plenty of milk. The correctness of this view is, in my opinion, most of all proved by my experience in Maternity Hospital. Before the introduction of the new treatment of the breasts, I had constantly cases of mammary abscess. But later I had only a single case during eight or nine years, and that was in a scrofulous little person upon whom I performed Cæsarean section, and who on her neck had large scars from suppurating glands in childhood. This wonderful immunity was obtained by dressing the sore nipples with tannin, compressing the breasts evenly with our waist, and keeping them empty either by letting the babies suck or by milking them with the fingers.

I am still more inclined to lay the greatest stress on the galactostasis as a factor in the production of mastitis when I compare the results in my hospital service with those of my private practice. Although the treatment ordered is the same, I do not entirely escape mammary abscesses in private practice, which I think is due to the inferior way in which private nurses, be they trained or untrained, carry out the treatment of the breasts. The less perfect depletion of the milk-ducts is, in my opinion, the only reason why the results are not so uniformly satisfactory in private practice as in the hospital. This view does in no way interfere with the theory of the microbes being the true cause of the mastitis. These enter through the apertures of the lactiferous ducts or are already in their interior. When the milk stagnates, they decompose it and cause inflammation of the surrounding glandular tissue. But the question is of the greatest practical importance, because the treatment becomes diametrically opposite.

The inflammation may also have its cause in sprue. When a child thus affected nurses, it may deposit the fungi on the sore nipple or in the openings of the lactiferous ducts, whence they find their way to the deeper parts of the breast.

Pus-producing microbes may, of course, also easily be brought from the genitals of the mother or from the umbilicus of the child, from the nurse's or the patient's own fingers, or from clothing, etc.

Primiparæ are much more apt to be affected, which probably is due to the fineness of the epithelium of the nipple. After having passed through two confinements and nursed her child a woman rarely gets an inflamed breast.

Symptoms and Course.—The inflammation begins generally in the second week of the puerperium, but may occur any time as long as the woman nurses. It is even as common in the tenth as in the first month, which is one sign among others that lactation should not be unduly protracted. It is heralded by a rigor, or chilly sensations, and temperature runs up to from 102° to 104° F. or still higher. The pulse is accelerated. The patient has no appetite, but complains of thirst, weakness, and pain in the breast. The breast becomes swollen, hot, and red, but in these respects there is some difference between the different varieties.

1. In *circumscribed subcutaneous mastitis* one or more points soon

become red and prominent, and fluctuation becomes distinct at an early date. In order to feel it, it is best to immobilize the breast against the thorax with the hollow of one hand, and examine the swelling with the other hand and some fingers of the first, or to compress the breast with one hand from side to side and press with the index-finger of the other on the most prominent point.

2. *Glandular Mastitis.*—We have seen (p. 94) how during pregnancy the mammary gland undergoes an enormous development. We can readily imagine how a mammary abscess may begin in different minute foci, which gradually become confluent and form one cavity. In most cases the inflammation begins just outside of the acini, but a glandular abscess may also begin under the skin or behind the gland and secondarily implicate the gland. One or more hard, tender, globular nodules or swollen, sensitive lactiferous ducts are felt. The skin is at first normal, but later it becomes red and hot, and sometimes œdematous. If suppuration supervenes, the hard nodule softens in the centre, and gradually the softness extends to the periphery. It may take from one to three weeks before the abscess is completed. Often one develops after the other, and the inflammation may extend to the subcutaneous or subglandular connective tissue. In such cases the process may take many months.

As a rule, the inflammation, if properly treated, ends in resolution in a few days, but if the initial fever lasts over four days the inflammation nearly always ends in suppuration. Œdema is also a sign of a deep-seated suppuration. Sometimes the pus is ichorous, offensive, and contains gas.

The *prognosis* is, as a rule, good. Mastitis rarely leads to general sepsis, but in protracted cases the constitution suffers and the victim may become tuberculous. Exceptionally, a blood-vessel has been eroded and given rise to fatal hemorrhage. A large part of the gland may be destroyed, fistulæ may remain, and old scars may predispose to the formation of another abscess in subsequent pregnancies.

3. *Subglandular mastitis*, like the subcutaneous, develops rapidly, and it ends almost constantly in suppuration. In from two to five days it is fully developed. The skin in this variety remains pale or is only slightly reddened; there are no nodules, but the whole breast is lifted up and gives the impression as if resting on an air-cushion. The pain is deep-seated. If neglected, this variety may penetrate the thorax and cause pleurisy, or extend down to the abdomen or up to the axilla and the neck. It may even corrode bones and cartilages. Fluctuation may be difficult to feel, so that it becomes necessary for diagnostic purposes to make an exploratory aspiration with a hypodermic syringe.

Treatment.—The prophylaxis is directed against the nipples and the breasts themselves. During pregnancy the nipples should be kept clean, emolliated, or hardened, and, if too short, cautiously pulled out (pp. 128, 762). During the puerperium they should be constantly examined and the slightest excoriation carefully treated, as described above. The application of the waist (p. 239) *in all cases* from the fourth to the ninth day has proved of immense value. If the child is dead or the mother does not want to nurse it, the breasts should be treated as described on p. 234.

In nursing women the breasts are emptied at regular intervals by one or, if there is a superabundance of milk, even two babies, unless sore nipples necessitate a temporary discontinuation of nursing, when the nurse should milk the breasts out as stated above.

With this treatment mammary abscesses practically disappeared from my service in Maternity Hospital, and even the earlier stage of mastitis became exceedingly rare. In mild cases, which probably are due to congestion, I only keep the breasts empty and compressed. If there are swelling, redness, pain, and fever, an ice-bag is applied, outside of the binder, over the seat of the inflammation, and kept in place with a piece of muslin pinned around the chest. A saline aperient is administered, and five grains of quinine are given three or four times a day.

A question of the greatest practical importance is as to whether or not the patient shall nurse. If the nipples are sore, it is better to suspend lactation for a few days and empty the breasts by milking. If the nipples are healthy, the more the child sucks the better it is. If, however, there is a pus focus in open connection with a lactiferous duct, it is necessary, in order to prevent the child from swallowing the abnormal admixture to the milk, to stop nursing from the affected breast. When the abscess is healed and hardness has disappeared, lactation may be resumed, but its effect ought to be closely watched, and at the first reappearance of pain, tenderness, or swelling, it ought to be forbidden at once and for good.

If suppuration is unavoidable, it is better to hasten it by means of warm flaxseed-meal poultices. When fluctuation or aspiration shows that the abscess has been formed, it should be opened. In the subcutaneous and the subglandular varieties this should be done at once. In the glandular it is better, if the abscess is deeply situated, to let it have time to approach the surface.

The subcutaneous abscess is generally small, and one moderately long incision with a bistoury is all that is required. On account of the tension of the skin, the opening will gape less and make a less unsightly scar if it is made in the direction of a radius from the nipple to the periphery of the breast.

If the abscess is situated partly under the areola and partly outside of it, the incision should either be made all inside or all outside of the line of demarcation between the areola and the common skin. Otherwise the pigmentation of the areola is apt to spread along the lips of the wound and cause a permanent irregularity of the contour of the areola.

The subglandular variety is opened where it points, which usually is outward and downward. In this case the incision, an inch or more in length, should be made parallel to, or, if feasible, at the contour of the breast, and, if no counter-opening is deemed necessary, a soft-rubber drainage-tube should be pushed in to the opposite wall of the abscess cavity, and a safety-pin fastened in the proximal end of the tube in order to prevent it from being drawn into the interior. A little gauze is wound around the pin, so as to avoid pressure on the skin.

The glandular variety often needs two or three openings in order to have good drainage, but they need not be more than half an inch in length. When the first is made, a probe is pushed through and the second incision is made against its point. The best drain is a bundle of horse-hair properly cleaned with soap and water and bichloride of mercury. The bundle is carried through from one opening to the other with a long, flat, blunt needle with a large eye, and tied loosely over the breast. Silkworm gut is also very good. Thin soft-rubber tubes may also be used, but their insertion, if it is done without an anæsthetic, is more painful than that of the other substances. The drains should remain as long as there is any discharge. If there is only one opening, the tube should be shortened gradually.

The operation is, of course, done with the usual aseptic and antiseptic precautions. The skin is disinfected, the instruments are boiled with soda solution, the abscess cavity is irrigated with lysol or creolin (2 per cent.), and finally the breast is covered with large pads of gauze wrung out of the same solution, some water-proof material, such as oil-silk, oil-muslin, or gutta-percha tissue, and all is kept in place by the breast-binder, which is sufficiently tightened to keep up a moderate pressure. The dressing is changed once a day, and at the same time the drains are cleaned by irrigation. Tonics, especially chloride of iron and strychnine, are given. By this treatment even a large abscess heals in eight or ten days.

Some women have, however, such a horror of the knife that they object to its use on their breast. In the subcutaneous and especially the subglandular variety, the doctor should insist, and tell the patient that if not opened the abscess may cause great destruction and even lead to a fatal issue. If situated in the gland it is not so imperatively indicated to open the abscess. Still the physician should inform the patient that by leaving it alone her pain will be much prolonged, that a larger part of the gland will be destroyed, that the suppuration may involve the subglandular and subcutaneous tissue, and that the scar will be much more unsightly. The pain may be lessened or deadened by the spray of ethyl chloride, by the previous subcutaneous injection of cocaine in the track of the incision, or, where a greater interference is expected, even by general anæsthesia.

If the abscess is covered by much glandular tissue, the incision of which may give rise to considerable hemorrhage, especially in old neglected cases, it is best only to cut through the skin, the subcutaneous fat, and the fascia. When the gland is reached, a pointed director is thrust through it into the abscess cavity, a pair of slender forceps is slid in on it and forcibly opened, so as to let out the pus. A drainage-tube is then inserted between the branches and the breast treated as just described.

If hard nodules remain after the abscess, they are rubbed and covered with resolvent ointments, such as unguentum hydrargyri, potassii iodidi, or plumbi iodidi. If the child is weaned, iodide of potassium may be given internally at the same time. The help of the galvanic current may also be invoked to scatter the swelling. Fistulæ will be considered below.

COLD OR CHRONIC ABSCESS OF THE BREAST.—Besides the acute suppuration described above, a chronic or so-called cold abscess may form in the breast in connection with lactation. It has been found in otherwise healthy women, without scrofulous or tuberculous antecedents. It is generally of the subglandular variety. It may begin as a common abscess with pain, but soon this subsides, and the inflammation progresses very slowly, during a period of from three weeks to two months. In other cases there is no pain at all.

Treatment.—As soon as the abscess is formed, it should be opened by one or more openings, and tincture of iodine should be injected or the sore dusted with iodoform. Otherwise the abscess is treated like the acute variety.

§ 9. **Swelling and Milk Retention in Accessory Mammary Glands.**—Occasionally I have seen a swelling of and milk retention in an accessory mammary gland in the axilla. Sometimes both sides were affected in the same way. In the axilla is found a painful swelling, sensitive to the touch, covered with skin of normal or pink color. Often the swelling is divided into two parts by a sulcus. There may be distinct fluctuation, but the aspired fluid is only milk. In spite of careful palpation I have not been able to find any connection between the axillary swelling and the mammary gland.

These swellings should be covered with a thick layer of unguentum iodi, when they disappear in a few days. I have never seen them suppurate.

§ 10. **Fistulæ of the Breasts.**—Two kinds of fistulæ are found in the breasts of nursing women; one is a remnant of an abscess that has not closed, and is mostly found in the gland or in the subglandular space, rarely under the skin. The secretion is pus. The other is a milk fistula, a fistulous tract leading from the skin to a lactiferous duct. This kind may also have originated in a mammary abscess which corroded a milk-duct. In other cases it is due to an injury by which such a duct was wounded. The secretion may be pure milk or milk more or less mixed with pus.

Such old fistulous tracts may cause a considerable drain on the strength of the patient and predispose to tubercular infection of the lungs.

Treatment.—If the patient nurses, the child should be weaned. Pressure should be exercised with pads over the course of the fistula. Astringent and irritant fluids should be injected into the tract, such as undiluted tincture of iodine; or a 2 per cent. solution of nitrate of silver, used two or three times a week; or Villate's solution:

℞ Cupri sulphatis,
Zinci sulphatis, āā ʒ ii (8 grammes);
Sol. plumbi subacetatis, ℥ ss (15 grammes);
Aceti, ℥ iij (90 grammes).
Sig.—To be mixed with twice as much water;

or Labarraque's solution (liquor sodæ chloratæ, U.S.P.), a fluidrachm of which is mixed with an ounce of water. With these mixtures the fistula is injected two or three times a day. It is also well to irrigate the fistulous tract with a two per cent. solution of carbolic acid once a day. If there is room enough the fistula should be scraped with Simon's sharp spoon and injected with iodoform glycerin (10 per cent.). If nothing else helps, the whole fistulous tract should be laid open, scraped, and dressed antiseptically.

§ 11. **Galactocele.**—In very rare cases the aperture of a lactiferous duct is occluded, secretion continues, the duct is at first dilated, and finally ruptures. As a rule, such milk tumors are small, but a case has been reported in which the breast hung down to the groin and contained ten pounds of fluid.

In the beginning the fluid consists of pure milk, but later the serum separates, the solid parts become inspissated, or bursting blood-vessels in the wall mix their contents with it and produce a variety of colors.

The *diagnosis* may be difficult. Before rupture the tumor may be taken for a cyst; after rupture it feels like an abscess. Exploratory puncture will decide.

Treatment.—Simple puncture does not suffice. Injection of tincture of iodine may produce sufficient adhesive inflammation to close the cavity. If not, this must be laid open and left to close by granulation.

§ 12. **Hypertrophy of the Breasts.**—Two conditions of life have a marked influence on the production of hypertrophy of the breasts—puberty and pregnancy. That of puberty is much more serious, since it hardly can be cured in any other way than by amputation.

That of pregnancy begins, as a rule, rather early, and continues during the whole period of gravidity and lactation, but, as a rule, it then stops, and the breast resumes gradually its normal dimensions.

All the elements composing the breasts increase evenly, without structural change. Both breasts may be affected or only one, or one much more than the other. Some women have the hypertrophy in every pregnancy. The breasts may become so enormous that they hang down to the middle of the thighs, and nearly equal the rest of the body in weight. When the breast grows it sinks down and forms a pedunculated tumor. The areola enlarges in circumference, and the nipple is flattened out. When the breast becomes heavy it drags on the pedicle and causes pain. When it becomes very large the skin covering it is apt to become inflamed and be the seat of abscesses, erysipelas, or gangrene. The patient has difficulty in breathing, loses her appetite, and becomes cachectic.

Pregnancy is often interrupted by premature labor. The fœtus sometimes dies *in utero* or the child is puny and weak.

The secretion of milk begins sometimes during pregnancy, and as much as six or seven ounces has been milked out daily. In other cases the secretion begins as usual after the birth of the child. In most cases the woman cannot nurse on account of the shape of the nipple, and then the secretion ceases in the course of a month or two. If, on the other hand, the patient can nurse, the secretion continues normally, and nursing may be kept up for a whole year. When it is discontinued, or if it is not begun at all, the breasts retrograde and finally resume normal proportions.

Treatment.—As soon as the breasts assume undue proportions they should be kept up and compressed with the breast-binder and a suitable corset. Ointments containing iodine or iodide of potassium, or both, may be tried, but do not seem to have much effect. Intercurrent inflammation of the skin should be treated according to the general rules of surgery. If the general health suffers seriously, it may be indicated to induce premature labor or even artificial abortion. But under no circumstances should the breast be amputated. If the woman can nurse she may, but her breast will need artificial support. After the child is weaned, or, if the patient does not nurse, immediately after confinement, involution may be furthered by support, compression, resolving embrocations and ointments, and the internal use of iodide of potassium.

Instead of producing hypertrophy of the breasts, pregnancy may be a cure for it. A curious case of this kind is on record in which a hypertrophy that had existed since puberty diminished gradually from the first pregnancy and disappeared totally after the third. Since the alternative is amputation, perhaps young girls may sometimes prefer to try marriage.

CHAPTER V.

DISEASES OF THE UROPOIETIC ORGANS.

§ 1. **Retention of Urine.**—Retention of urine, or *ischuria*, is a rather common occurrence in childbed. Sometimes it seems to be due to mere lack of innervation. Thus, I have found it in most cases where perineorrhaphy has been performed. At other times it may be due to a kink in the urethra, caused by the sudden subsidence of the uterus and bladder after the expulsion of the fœtus. If labor is hard, and especially if it has to be finished artificially, the urethra, squeezed between the head and the pubic arch, easily becomes bruised and subsequently swollen. An inflammation of the vulva may extend to the urethra and make it swell. If peritonitis develops and the peritoneal coat of the bladder is implicated in it, the wall may become œdematous and the detrusor muscle paralyzed.

Treatment.—In all these cases the urine may with facility be drawn with a catheter, but catheterization in childbed has the great drawback that, on account of the lochial discharge, it easily gives rise to cystitis. If ever possible, it should therefore be avoided. There are little tricks which often help one out of the difficulty. By pouring into the bedpan hot water or, still better, an infusion of chamomile flowers, which has more effect on the imagination than plain water, the vapor rises against the genitals and induces a desire to urinate. Or cold water may be poured over the vulva. Many people can urinate readily if they hear the water run from a faucet into a basin. If this does not help, and the patient is in good condition, we may let her sit on a chamber-pot in bed or even get out of bed and use a commode.

If it becomes necessary to use the catheter, the patient should lie on her back, the vulva should be spread wide open and carefully washed with a copious amount of some disinfectant fluid,—for instance, a 1 per cent. mixture of lysol and water,—and a catheter made aseptic by boiling or chemicals should be introduced with the greatest gentlene [illegible] in.

§ 2. **Incontinence.**—A minor degree of inability to retain the urine is not very rare among lying-in women. Especially during the act of coughing a little urine may escape involuntarily. This is doubtless due to the contusion of the urethral sphincter muscles by pressure between the head of the fœtus and the pubic arch. This weakness passes off in a few days, and restoration to the normal power may be furthered by the administration of strychnine (gr. $\frac{1}{15}$—4 milligrammes—t. i. d.).

If the urine escapes continually, the cause is probably a fistula, about which presently more will be said.

§ 3. **Cystitis.**—Inflammation of the bladder is not rare in childbed. It is due to microbic invasion, especially by a diplococcus much like the gonococcus. As a rule, the infecting agent is present in the lochial discharge and carried with a catheter into the bladder.

The inflammation may, however, also appear in cases in which no catheter has been used, and is then due to the active entrance of the microbes through the urethra, especially if the vulva is inflamed. Contusion of the bladder during labor does not by itself produce cystitis, but bruised tissue is a favorable soil for the germs of disease. As some time is needed for incubation, the inflammation does not appear before several days or even in the second week after confinement.

Cystitis is characterized by pain in the hypogastric region, frequent desire to urinate, pain during micturition and especially at the end of the act. The urine is turbid and forms a sediment composed of pus-corpuscles.

In most cases it is a disease of little importance and curable in a few days or a couple of weeks; but sometimes the inflammation extends upward through the ureters to the pelves of the kidneys and to these glands themselves. It is particularly when the urine has an offensive odor that this ascension may be feared. Pyelitis and nephritis are ushered in by high fever and pain in the lumbar region. Microscopical examination shows the characteristic epithelial cells of the ureter and the kidney, which differ from those of the bladder. The fever may subside in a week or two, but it is apt to return after intervals of weeks or months.

Treatment.—The patient must abstain from spiced food and alcoholic drinks. She should have plenty of fresh water, mineral waters, and milk. French Vichy, half a tumblerful at a time, a quart a day, is particularly soothing. Among the domestic waters Poland, Bethesda, Waukesha, and Buffalo lithia water are useful by producing a copious diuresis. The following mixture is a favorite prescription of mine:

℞ Tinct. belladonnæ, ʒii (8 grammes);
Liq. potassæ, ℥i (30 grammes);
Aquæ dest., q. s. ad ℥iv (120 grammes).—M.
Sig.—A teaspoonful in a wineglassful of water four times a day.

Other good remedies are salicylate of sodium (gr. xv—1 gramme—t. i. d.), salol (gr. x–xv—from 60 centigrammes to 1 gramme—t. i. d.), and, if the urine is alkaline, the saturated solution of boric acid (℥ss—15 grammes—four to six times a day), or benzoate of ammonium or sodium (gr. v to xx—from 30 to 120 centigrammes—every four hours). Opiates may be necessary to combat pain, especially suppositories with pulvis opii (gr. i—6 centigrammes). If there is a bad smell to the urine, cystogen (gr. v in tablet) or urotropine (a tablet with gr. viiss—50 centigrammes), that is formalin, works like a charm. A warm linseed-meal poultice placed over the hypogastric region, and renewed every two hours, is very grateful. In order not to carry new infecting germs into the bladder, it is better to avoid irrigation, but if the inflammation does not yield to treatment by the mouth, the bladder should be washed out. The drug I ordinarily use is boric acid (½–2 per cent.). As this dissolves with difficulty in water, a saturated—that is 4 per cent.—solution should be made and mixed with from seven to equal parts of lukewarm water. The injection is repeated daily. About a pint is used each time. Other fluids that may be used are chlorate of potassium (2 per cent.), salicylic acid (1:300); nitrate of silver, carbolic acid, creolin, lysol (all 1:500); and thymol (1:1200).

§ 4. **Fistulæ.**—A fistula is an abnormal opening leading from the genital canal to the urinary tract or the intestine.

According to the nature of the extraneous matter that finds its way into the genital canal, fistulæ are divided into *urinary* and *fecal.*

A. URINARY FISTULÆ are again divided, according to the organs brought into abnormal connection with one another, into, 1, *vesicovaginal;* 2, *urethrovaginal;* 3, *ureterovaginal;* 4, *vesico-uterine;* 5, *vesico-uterovaginal;* 6, *uretero-uterine;* and, 7, *ureterovesicovaginal.*

There may be one or more fistulæ, and in size they vary from a scarcely visible aperture to an opening admitting two fingers.

The most common is the vesicovaginal fistula.

By far the most frequent cause of all kinds of fistulæ is childbirth. The mechanism may be twofold. The abnormal communication may be due to a tear, when it appears immediately after delivery: or it may be produced by pressure and consequent necrosis. In the latter case the fistula does not occur before days or even weeks have elapsed since parturition took place. At the time of delivery the parts become bruised, mortification gradually develops, and finally the dead plug is expelled, leaving a hole.

Tears are especially found in old primiparæ or after the use of ergot or in cases in which the forceps was applied before the cervix was sufficiently dilated. Pressure is due to a disproportion between the fœtus and the genital canal, a distended bladder, a loaded rectum, a stone in the bladder, abnormal presentation, etc. The tissues withstand much better the same degree of pressure if it is exercised for a short time. Pressure fistulæ are therefore, as a rule, not due to the use of the forceps, but to improper delay in their application. As soon as the presenting part becomes impacted and does not move to and fro during and between labor-pains, artificial help ought to be given. In consequence of the improved obstetrics and the more frequent use of the forceps, fistulæ have become much rarer than formerly, and the patients come mostly from remote localities, where proper assistance during labor is not available.

Symptoms.—The chief symptom of a urinary fistula is the more or less constant dribbling of urine from the vagina, but this does not suffice for a diagnosis, since the same takes place if the sphincters of the urethra are paralyzed; and, on the other hand, if the urinary fistula is situated high up in the partition between the bladder and the genital canal, the urine may be retained for a long time when the woman is in the erect posture, and in urethrovaginal fistulæ it may be entirely retained except during voluntary micturition.

In spite of the utmost cleanliness, fistula patients have a disagreeable ammoniacal odor.

Diagnosis.—If the fistula is large, it may be felt by digital examination of the vagina. In most cases it can be seen by introducing a speculum and placing the patient in different positions, especially Sims's, the genupectoral, and the dorsal with raised knees and more or less elevated pelvis.

Sometimes, however, the opening is so minute that it cannot be seen, or it may be hidden by a projecting fold or cicatrix. In such cases the presence of a vesicovaginal fistula may be established by injecting a colored fluid—for instance, milk—into the bladder, when the fluid will appear immediately in the vagina.

Since the ureters cross the cervix at a distance of about ½ inch and traverse the fornix of the vagina, fistulous connections between these organs may originate in labor. A *ureterovaginal fistula* is situated on the anterior wall of the vagina, a little below and outside of the vaginal portion of the uterus. It is distinguished from a vesicovaginal fistula by introducing an elastic catheter, which if the fistula is ureteral can be pushed deep in the direction of the corresponding kidney, and urine will spurt out from it in jets. Milk injected into the bladder through the urethra will not appear in the vagina, but, if the portion of the ureter between the fistula and the bladder is pervious, a probe introduced through the fistula may be made to come in contact in the bladder with a sound passed through the urethra.

In the *uretero-uterine fistula* there is an opening leading from the ureter to the cervical canal, and urine passes out through the os uteri. The same is the case in the *vesico-uterine fistula*, where there is a tear through the anterior wall of the cervix and the base of the bladder. But these two varieties may be distinguished from each other by the injection of milk into the bladder. If the communication is between this organ and the cervix the milk comes out through the os, but not so in ureterocervical fistula.

The *vesico-uterovaginal fistula* goes from the bladder through the anterior lip of the cervix and ends in the vagina.

In the *ureterovesicovaginal fistula* there is a vesicovaginal fistula, which implicates the ureter, so that this organ opens on the edge of the fistula.

Prognosis.—Some fistulæ close by themselves, especially the vesico-uterine. In other cases the opening generally becomes much smaller than it is when it first appears.

Treatment.—During the puerperium there is not much to be done, except to keep the parts clean by vaginal antiseptic injections. Small fistulæ may after the first nine days be painted with tinctura cantharidis or cauterized with lunar caustic, nitric acid, or carbolic acid. Operations should be postponed until the parts have undergone perfect involution,—say six or eight weeks,—during which time spontaneous healing may occur, or the fistula will at least become much smaller and the tissues will regain their normal tone.

B. FECAL FISTULÆ.—A fecal fistula constitutes a connection between the genital canal and some part of the intestine. It is much rarer than urinary fistulæ.

The abnormal communication may take place between the rectum and the vulva—*rectovulvar* or *rectolabial fistula*—or between the ileum or the sigmoid flexure of the colon and the vagina or the uterus—*enterovaginal*, *ileovaginal*, and *ileo-uterine fistula*.

The opening may be so small that it is difficult to discover, or large enough easily to admit a finger.

The opening is most commonly located either immediately above the sphincter ani muscles or at the vault of the vagina. As a rule, it is found on the posterior wall of the vagina, but the enterovaginal variety may exceptionally open in front of the uterus.

A fecal fistula may be due to pressure between the head of the fœtus and some bony protuberance in the pelvis. It may also be brought about by rupture of the uterus or the vagina, an intestinal knuckle being caught in the rent and becoming necrotic. Or it may originate in diphtheritic or gangrenous processes arising from puerperal infection.

Symptoms.—The escape of flatus or, when the bowels are loose, excrementitial matter soon attracts the attention of the patient or her nurse.

Of enterovaginal fistulæ there are two varieties with very different symptoms. If the opening is small, they do not differ materially from other fecal fistulæ ; but if the whole circumference of the intestine has been destroyed, and the edge coalesces with that of the rent, forming a *preternatural anus*, all the fæces find their way through the vagina. If the affected part, as usual, is the ileum, undigested food mixed with bile will make its appearance at the fistula about two hours after every meal. The patient loses flesh and finally dies of starvation.

Diagnosis.—Large fecal fistulæ may be felt; small ones may be seen, but are often hard to find on account of their diminutive size. Probing and injection of colored fluid may help to find the inner opening.

In an enterovaginal fistula, a whole intestinal knuckle having been destroyed, there may be two openings with a so-called *spur* between them.

Prognosis.—While fresh urine is entirely innocuous, fæces abound in a variety of microbes, which, when there is a fecal fistula, enter the vagina and may give rise to infection during the puerperium. This kind of fistula has a greater tendency to spontaneous healing than urinary fistulæ, but, on the other hand, they are harder to close by operation.

Treatment.—What has been said about urinary fistulæ applies also to fecal fistulæ. During the puerperium the parts should be kept clean, and operation deferred till after complete involution.

CHAPTER VI.

DISEASES OF THE CIRCULATORY ORGANS.

§ 1. **Embolism and Thrombosis of Arteries.**—Arteries may become obstructed by the arrest of an embolus in their lumen or a coagulation of the blood, or both combined. Such conditions have been found in the cerebral arteries, the humeral, the femoral, the popliteal, the anterior tibial, the dorsal artery of the foot, and even in the aorta and both common iliac arteries.

Etiology.—A piece of a vegetation on the valves of the heart may be detached and carried by the blood-current to some more or less remote locality. These vegetations may be of old date and due to rheumatism, or they may have formed during the puerperium in consequence of puerperal infection and endocarditis.

The wall of an artery may become inflamed and roughened, and this may cause stagnation and coagulation of the blood, which itself is more apt to undergo such changes during the puerperium on account of the altered chemical composition of the blood and the weakness and slowness of cardiac contraction.

Symptoms.—The symptoms of arterial obstruction vary with the site and the completeness or incompleteness of the barrier to circulation. I have seen sudden death occur from closure of the basilar artery. Sudden blindness followed by destruction of the eyeball is probably due to the occlusion of the ophthalmic artery. If the middle cerebral artery is blocked up, hemiplegia of the opposite half of the body occurs, followed by softening of the corresponding part of the cerebrum. In a case in which a thrombus occupied the lower part of the abdominal aorta and both common iliac arteries, both lower extremities became gangrenous.

However, even the complete obliteration of the lumen of the chief artery of a limb need not necessarily lead to gangrene. Generally, a collateral circulation is established, and it is only when this too is interrupted, or the corresponding veins become impervious, that local death must ensue.

A chief symptom of arterial obstruction is pain, which may be very severe and sometimes has the neuralgic type. The affected part becomes cold and numb. Pulsation is abolished below the seat of the obstruction and increased in volume above it. If the occluding body is an embolus, the arrest of pulsation may occur suddenly. If it is a slowly forming thrombus, the disappearance is gradual.

Prognosis.—It results from what has just been said that arterial occlusion is a grave accident, which may lead to local mortification, great functional disturbances, or death.

Treatment.—Art can do very little in this sad conjuncture. Absolute rest of the affected portion of the body is indicated in the hope of favoring the establishment of a collateral circulation and the absorption of a thrombus. The severe pain calls for powerful anodynes. The affected limb should be covered with hot cloths soaked in some stimulating fluid, such as infusion of hops, chamomile flowers, or wine. The patient's strength should be kept up by tonics, strong wine, and generous food. If gangrene supervenes, we should await the formation of a line of demarcation and then amputate somewhat higher up.

§ 2. **Thrombosis and Embolism of the Venous System; Heart-Clot.**—We have already spoken of thrombosis and embolism in the venous system in connection with puerperal infection (see pp. 706, 714). We have particularly dwelt on the disease called phlegmasia alba dolens, which often is due to venous thrombosis beginning at the placental site. But apart from infection the blood may coagulate in different parts of the venous system, inclusive of the right side of the heart and the pulmonary arteries, and give rise to protracted illness, severe suffering, or sudden death.

THROMBOSIS OF THE LOWER EXTREMITY.—*Isolated thrombosis of the leg* is not rare during pregnancy. In the puerperium such a pre-existing thrombus may increase in size or new ones may develop. It begins ordinarily in the second week after childbirth, and generally in a superficial vein of the calf or in the popliteal space. Sometimes it starts in varicose veins. The slow pulse; the general weakness; the feeble cardiac contractions; the chemical composition of the blood, which contains a superabundance of fibrin and is charged with effete material from the uterus, that is undergoing involution; the rest in bed; the absence of muscular activity,—all are circumstances normally connected with the puerperal state, but which predispose to stagnation and coagulation of the blood. The amount of fibrin in the blood is in the unimpregnated state about 3 per 1000. During the first six months of pregnancy it decreases to 2½ or 2¾ per 1000, but during the last three months it rises to 4 or more.

To these physiological conditions may be added pathological processes that enhance the tendency to thrombosis. The heart may be weakened by fever. The free circulation may be impeded by pelvic exudation. There may have been loss of blood during or after labor, which increases the coagulability of the blood. In a case in which all four extremities were bandaged during nineteen hours on account of inversion of the uterus, thrombi developed in the legs.

Symptoms.—The affected part of the vein is felt as a hard string, sensitive to touch. There may also be some spontaneous pain. If one of the larger veins, such as the femoral, the popliteal, or the saphenous, becomes impervious, there is swelling of the extremity, beginning from the foot and gradually extending upward, and considerable pain. The thrombus has no tendency to implicate the pelvic veins. There is ordinarily no fever.

The thrombus is generally absorbed with restitution of the circulation of the blood through its lumen; or it may become organized, closing the vein permanently. The resolution takes from two to three weeks. In rare cases the thrombus may irritate the vein, causing phlebitis and periphlebitis, which may end in an abscess that breaks through the skin. The inflammation is, of course, accompanied by rise in temperature.

The *treatment* has been described above (p. 745).

Thrombosis of the veins of the upper part of the thigh may be brought on by simple extension of a non-infected thrombus of the pelvic veins (p. 706). This condition, known as *phlegmasia alba dolens*, is characterized by swelling, beginning at the upper end of the thigh, and considerable pain. Sometimes the thrombosis is ushered in by a chill. In the course of about three days the whole extremity is swollen. At the end of a week detumescence begins; but sometimes, after a lapse of ten days to two weeks, the other leg becomes affected in a similar way either by extension of the thrombosis to the vena cava or by a new thrombus forming independently on the other side. It may therefore take a month or two before recovery is complete.

Venous thrombosis may lead to embolism of the pulmonary artery or to gangrene.

EMBOLISM.—A piece of a thrombus may be broken off and carried to the right side of the heart or through it into the pulmonary artery. Generally it is arrested at the bifurcation, where the passageway suddenly narrows. It consists of a grayish-white mass that sometimes fits exactly to the thrombus in the lower extremity from which it has been broken off. If the embolus obstructs the whole artery, sudden death must ensue; but if the obstruction is only partial, life may continue and the fibrin of the passing blood is precipitated in layers around the embolus. The outer, fresh layers are harder than the centre, which becomes softened. If the patient lives, the clot may be reabsorbed, shrinking to a band or a thread, and finally disappearing. Sometimes the clot lies loose, in other cases it adheres to the wall.

There is hardly any doubt that, as a result of the same causes which produce a thrombus in the lower extremities, *a clot may also form primarily in the heart or in the pulmonary artery* or its branches. Such a thrombus may begin in the smaller ramifications of the pulmonary artery and gradually grow backward towards the heart, terminating with a rounded-off end. In other cases it seems to have begun in the heart itself, to the inside of which it is fastened, while a band-like prolongation hangs loose in the pulmonary artery.

Symptoms.—Whether the clot is formed by an embolus coming from a distance or by thrombosis of the heart and pulmonary artery themselves, has only little influence on the symptoms. Embolism occurs, however, later than autochthonic thrombosis. The former has not been observed before the nineteenth day after confinement, while the latter appears within a fortnight and often ends in death on the second or third day of the puerpery. In embolic cases signs of phlegmasia precede the attack, while in thrombosis they may develop subsequently. Thrombosis is likely to develop more gradually, whereas the lodging of an embolus in the pulmonary artery will precipitate symptoms and may end in death in a few minutes.

The most striking symptom is the sudden appearance of the most terrific dyspnœa. Respiration is hurried. The patient gasps for breath, throws back the cover, tears the clothes from her chest. All inspiratory muscles contract forcibly. Sometimes convulsions occur. The face is either deadly pale or deeply cyanosed. The action of the heart becomes tumultuous and irregular. The pulse becomes thread-like. Temperature falls below normal. Over the pulmonary artery may be heard a blowing or rasping murmur. Sometimes swelling of the face and neck has been noticed. The intellect remains clear. In cases that do not end in immediate death there may be repeated attacks, especially after unusual exertion, such as sitting up in bed or rising. Death is due to asphyxia. It is true the air can be heard to enter the lungs, but the blood cannot reach it, or at least not over a sufficiently large area or in sufficient quantity to be fully oxygenated. Death may be almost instantaneous or occur after several days. In other cases recovery is established gradually.

In several instances the attack began during an inunction for thrombosis of the lower extremity. Sometimes an increased frequency of pulsation and a rise of temperature have preceded the attack.

Treatment.—The prophylaxis consists in rest when there is thrombosis anywhere in the body, and in avoidance of manipulations that might dislodge a thrombus or break off a piece from it. It is, therefore, not safe to rub resolvent ointment into the skin over the thrombus. Only substances that can be painted on with a brush, such as tincture of iodine, oleate of mercury, or a fluid mixture of blue ointment and oil, should be employed.

If an embolus has lodged in the pulmonary artery or a heart-clot has formed, our resources are sadly restricted. Sometimes death occurs with such lightning haste that there is no time for any therapeutic measures. Under more favorable circumstances the first indication is to try to keep the patient alive. She must be kept quiet, and even nearly motionless, in most cases in a recumbent position; but in this respect we must observe and follow nature: if the patient breathes better in a sitting posture, it would be folly to force her to lie down. She should only be well propped up in the posture that interferes least with respiration. Alcoholic drinks seem to have a better effect than anything else, and should be given freely and repeated frequently. Hypodermic injections of strychnine, nitroglycerin, digitalis, strophanthus, and atropine may also prolong life, and thus increase the chances of recovery.

The dyspnœa may perhaps be relieved by dry cupping of the chest. If that does not help, wet cupping or even phlebotomy should be tried. In the hope of resolving the clot, aqua ammoniæ fortior ♏x (60 centigrammes) mixed with aqua destillata ℥ss (15 grammes) may be injected into a vein; and of common aqua ammoniæ ♏xx (1.30 grammes), properly diluted, may be given hourly by the mouth.

§ 3. **Entrance of Air into the Veins of the Uterus.**—During delivery and within a few hours after the end of labor air may find its way into the veins of the uterus and be carried through the vena cava to the heart, the lungs, and even into the arterial system. It has been found in all parts of the vascular system, most frequently in the uterine veins, in the vena cava inferior, in the cavities of the heart, in smaller branches of the pulmonary artery, and in the coronary arteries.

Many features of childbirth are calculated to invite and favor the entrance of air. Even in normal delivery, with the woman in the dorsal position, air enters easily through the large gaping vulva, vagina, and cervix. By its normal contractions and relaxations that follow the expulsion of the child, the uterus may pump the air into the cavity like a suction-pump; and once there, if the entrance is closed, the air may by the same action be pressed into the veins of the placental site as with a force-pump. Normally, the sinuses of the placental site are closed during and immediately after the detachment of the placenta, but in some cases of entrance of air into the veins they have been found gaping with openings an eighth of an inch in diameter. In the semi-prone and still more in the knee-chest position, the uterus sinking upward and forward, gravity facilitates the entrance. If we introduce the hand into the uterus in order to perform version or detach an adherent placenta, the air may follow the manipulating hand into the uterine cavity. Entrance into the veins becomes particularly easy during version for placenta prævia, in cases of rupture of the uterus, or in Cæsarean section if the incision goes through the placenta. The pumping action of the heart may aspire the air. When a great quantity of liquor amnii is discharged at once, air may rush in to take its place. Sometimes the air has been directly pumped into a uterus in giving vaginal or intra-uterine injections.

Many different theories have been advanced as to what is the real cause of death when air enters the venous system. Most likely it is due to the air forming emboli, which prevent the free circulation and oxygenation of the blood and cause asphyxia, a theory which finds a solid basis in the great similitude in the clinical aspect of cases of solid emboli and those of entrance of air. Others attribute the sudden death to anæmia of the brain or paralysis of the heart.

Symptoms.—The condition is characterized by sudden terrific dyspnœa. Sometimes the patient utters a loud cry, in others she dies without a sound as if struck by lightning. If the course is less rapid she complains of severe pain in the chest, and may have rigors. In rare cases the dyspnœa subsides and the patient recovers.

Prognosis.—The mortality is enormous. Out of 43 cases 39 ended fatally.

Diagnosis.—Sometimes a crackling sound is heard in moving the hand over the abdomen, like the one observed in emphysema, and due to the presence of air in the veins of the uterus. If present, this sign makes the diagnosis certain.

Treatment.—It appears from the above that it is safer to perform operations in which the hand enters the uterus with the patient in the dorsal position. This applies particularly to operative interference in cases of placenta prævia or rupture of the uterus. If in normal cases we deliver the child with the woman in the left-side position, she should immediately after expulsion of the child be turned on her back. Vaginal and intra-uterine injections should always be given with the patient lying in the dorsal position. No kind of pump should be used for these injections during labor and in the puerperium, but exclusively fountain-syringes, from which the air should be driven out before the injection is made.

If thus we may do something to prevent the entrance of air into the veins, we are almost powerless in combating it when it has taken place. If the patient does not die immediately, a stimulating treatment similar to that described for heart-clot should be instituted.

§ 4. **Gangrene of the Legs.**—In speaking of arterial and venous obstruction we have mentioned that it may lead to gangrene; but the accident being such an important one for the patient, and having given rise to a suit for damages,[1] we shall enter a little more fully on the question.

In most cases the gangrene is preceded by phlegmasia alba dolens, and it has been observed where the veins of the foot alone and no arteries were affected. In other cases there was an embolus in an artery and no obstruction in the veins, and in others again both arteries and veins were blocked up. A thrombus or embolus on one side may by fibrinous precipitation extend upward and reach the aorta or vena cava and descend through the common iliac vessels to the other extremity, so that the gangrene becomes double. In one case all the toes, the fingers of one hand, and an ear became gangrenous, which may have been due to Raynaud's disease. As a rule, the gangrene is of the dry variety; the humid is found only in cases of general sepsis.

Etiology.—An embolus may be torn off from the valves of the heart when there previously has been endocarditis, or it may come from the venous system through an open foramen ovale of the heart.

---

[1] E. Wormser, Centralblatt für Gynäkologie, 1900, vol. xxiv., No. 44, p. 1154.

Primary arterial thrombosis may start at the placental site and extend upward to the common iliac artery and even the aorta and the common iliac on the other side. Venous thrombosis may also begin at the placental site or in the extremity itself; but in order that the foot shall become gangrenous without closure of the external or common iliac vein, all its veins must be blocked up, which probably can be brought about only by that increase in coagulability towards the end of pregnancy and in the puerperium which we have spoken of above.

If the obstruction is found in both the arterial and the venous system, the development of gangrene is, of course, much easier.

Symptoms.—The disease begins at a length of time after confinement varying from four days to three months and a half. In cases of embolus the start is sudden, while in other cases the development extends over several days. The patient complains of severe pain in the affected extremity. The limb swells. Sensation is lost. General temperature rises. The pulse becomes more frequent, and it may stop altogether in the threatened limb. The skin becomes cold, pale, and later dark blue, and vesicles filled with serum may rise on it. When local death has occurred, the pain ceases. As a rule, a distinct line of demarcation is soon established.

The *prognosis* as to life seems to be good, except when there is general sepsis or no line of demarcation forms; but the gangrenous portion of the limb is, of course, irretrievably lost.

Treatment.—Prevention can only consist in elevating the limb in which there is an obstruction, strengthening the heart, and keeping the threatened part warm. As soon as a line of demarcation is established, amputation in the healthy tissue should be performed. If there is no such boundary and the gangrene spreads rapidly, it is wise to do the same; but then the outlook for a good result is much less favorable.

§ 5. **Anæmia.**—Great loss of blood immediately after confinement or during the puerpery may lead to a state of anæmia that may extend over months and even years. It is characterized by the pale color of the skin, general weakness, and a weak, rapid pulse. In regard to treatment, we may refer to what has been said about the later stage of convalescence after post-partum hemorrhage (p. 515). A sea voyage on a sailing vessel or a slow steamer, or a change either to a milder or a more bracing climate, is also to be recommended; but mountains are to be avoided on account of the low atmospheric pressure, which may injuriously affect the heart, the brain, or the kidneys.

CHAPTER VII.

DISEASES OF THE NERVOUS SYSTEM.

§ 1. **Neuralgia and Pressure Paralysis.** — During labor some women experience a violent neuralgic pain in one of the lower extremities, which is due to pressure on the sacral plexus. Sometimes the pain is localized in the area of the peroneal nerve or in the gluteal region, corresponding to the superior gluteal nerve. In some cases the leg is thrown violently up during each uterine contraction. It is especially a generally contracted pelvis that predisposes to such neuralgias, while in a flat pelvis the protruding promontory protects the nerve trunks against pressure.

The same pressure that causes pain during labor may result in paresis, paralysis, or numbness of the whole lower extremity or particular groups of muscles. Thus the disturbance may be limited to the area innervated by the peroneal nerve, which is explained by this nerve originating from the lumbosacral cord, which receives its fibres from the fourth and fifth lumbar nerve, and crosses the brim of the pelvis, where it may be exposed to isolated pressure. The result is a paralysis of the anterior and outer muscles of the leg, in consequence of which the foot is thrown into strong plantar flexion and curved inward.

In these cases the paralysis is similar to that occurring in the upper extremity of a person who falls asleep with the arm hanging over the back of the chair, and to most cases of what has been described as anæsthesia paralysis.[1] It is especially frequent after forceps delivery, but has been observed also in spontaneous labor with vertex or face presentation. In most cases this paresis or paralysis from pressure passes off in a few days, but after severe injury the lameness may remain for months or years. Sometimes *hemiplegia* occurs during delivery or in the puerperium, which is due to apoplexy or embolism. *Paraplegia* has also been observed, but is very rare.

Diagnosis.—In cases of lameness after difficult forceps delivery it should be remembered that rupture of the symphysis pubis gives similar symptoms.

Treatment.—For the neuralgia of labor recourse must be had to subcutaneous injections of morphine and to inhalation of chloroform.

The paralysis should be treated with faradization, massage, hydrotherapeutics, and injection of strychnine into the affected muscles.

§ 2. **Neuritis and Polyneuritis.**—In some of the above-mentioned cases the injured nerves may become inflamed, and the inflammation may extend from the pelvis to the inferior extremity, but the origin is plainly traumatic and referable to the time of labor.

---

[1] Garrigues, "Anæsthesia Paralysis," Amer. Jour. Med. Sci., Jan., 1897, and Diseases of Women, third ed., p. 208.

In other cases a pelvic exudation brought on by inflammation following labor may press on a nerve trunk and give rise to pain and lameness, which symptoms will then begin some time after labor.

In other instances, again, symptoms of neuritis appear from one to three weeks after childbirth, which in no way can be referred to pressure on nerve trunks during or after labor.

The affection does not seem to be very rare, since a comparatively large number of cases—thirty-eight—has been reported within a few years. With the material at present known, two forms may be distinguished,—a *localized* and a *diffuse*,—and the localized is again subdivided into an *arm type* and a *leg type*.

The localized, or lighter, form begins for the most part in the arms. Either one or both upper extremities may be affected. It is especially the median and ulnar nerves that become the seat of the disease. More rarely the lower extremities, and then generally only one of them, are affected. It is particularly the sciatic nerve that suffers. Sometimes the neuritis of the lower limbs is consecutive to that of the upper. The muscles of the trunk may also be affected.

Symptoms.—The affected nerves become sensitive to pressure; the patient suffers great pain. In some cases there was a burning and pricking sensation in the hands. The muscles innervated by the inflamed nerve become lame or paralyzed. Sometimes they are contracted. In some cases the affected area is numb or anæsthetic, and occasionally the seat of cramps. Reflexes may undergo changes. Often the affected part becomes œdematous. Later the muscles atrophy, and the nerves show the reaction of degeneration.

The prognosis in this form is, as a rule, favorable, the disease ordinarily ending in recovery.

The *diffuse, or generalized, form* is much rarer, but also much more severe. The cerebral nerves become implicated. There may be paralysis of the eye muscles, diplopia, and vertigo. Paralysis of the pneumogastric nerve causes difficult deglutition and respiration, which has even been fatal. But, generally, even in this worst form the prognosis is better than one would expect from the serious condition present, experience having shown that great improvement and even complete recovery may follow.

The *etiology* is by no means clear and probably not uniform. Loss of blood, anæmia, alcoholism, syphilis, cachexia, and marasmus seem to have been at least predisposing causes in some cases. Uncontrollable vomiting in pregnancy may also give rise to neuritis after the birth of the child. Some cases develop in connection with phlegmasia alba dolens; many are undoubtedly of septic origin.

Treatment.—Rest in bed or on a lounge is imperative. In the beginning an ice-bag or hot applications may have a soothing effect. The hypodermic injection of carbolic acid with or without morphine is a more active cure.

℞ Acidi carbolici, ♏x (60 centigrammes);
Morphinæ sulphatis, gr. v (30 centigrammes);
Aquæ destillatæ, ℥i (30 grammes).

Of this mixture ♏xv are injected once daily deep into the tissue, close up to the nerve. Unguentum hydrargyri and unguentum belladonnæ, equal parts, may be used for inunction or application. Internally the sodium salicylate, salol, iodides, quinine, iron, arsenic, and strychnine are indicated as resolvents and tonics. Phenacetin, antikamnia, and opiates are needed to combat the pain. At a later period, after all pain has ceased, galvanism and faradism should be used to hasten restitution of the nerves and prevent atrophy of the muscles. The electric treatment may to advantage be combined with massage and passive movements. And last of all recourse may be had to active gymnastics.

If there is a pelvic exudation, this should be combated with hot douches, ichthyol glycerin, tincture of iodine, the galvanic current, etc.[1]

Neuritis has likewise been observed in pregnancy, and was also then allied to uncontrollable vomiting. Both lower limbs and the back were affected. There were hyperæsthesia of the special senses and irregular action of the diaphragm. The case had a fatal issue, and the autopsy revealed degeneration of nearly all the nerves of the body, especially the phrenic nerve.

§ 3. **Tetanus and Tetanoid Contractions.**—When the author published his investigation about these conditions,[2] which had the honor of being translated in full in the *Archives Générales de Médecine* of Paris, this disease was hardly mentioned in text-books on obstetrics. I collected fifty-seven cases, but a later investigator has brought the material up to one hundred and six cases, and of late years reports have increased in number.

In America and Europe puerperal tetanus is a very rare disease, while it is quite common in India, not only as compared with its appearance in other countries, but also with tetanus from other causes in the same country.

Etiology.—We now know that the real morbific agent is the tetanus bacillus, a microbe which produces a kind of poison much like strychnine, and which has been found in the cavity of the uterus of several patients affected with puerperal tetanus. This bacillus may be carried from one patient to another on the hands of the physician, but more frequently it is brought in on dressing material or in water used for injections; but, since puerperal tetanus is such a rare disease, and on the other hand tetanus of the new-born child is so common, there must be other factors which play a *rôle* in the production of the disease.

---

[1] For further particulars see Garrigues, Diseases of Women, third ed., p. 699.

[2] Garrigues, "Obstetrical Tetanus and Tetanoid Contractions," Amer. Jour. Obstetrics, Oct., 1882.

Besides the already mentioned influence of a hot climate, other predisposing or concomitant causes deserve attention. Thus, the negro race is much more liable to this infection than the white race. The disease is more common in the wet season. It appears much more frequently in country practice than in cities; and at a time when antiseptic midwifery was unknown or in its infancy, and when epidemics of "puerperal fever" raged in lying-in hospitals, tetanus was hardly ever seen in these institutions.

Advanced age, primiparity, and mental excitement have some influence, and hemorrhage is a most important factor. Prolonged lactation has a similar effect. In several cases the patients have risen too early and exposed themselves to wet and cold, by which perspiration and lochial discharge were suddenly checked.

The disease is much oftener allied with abortions than with deliveries at term. Operations, especially artificial abortion, artificial detachment of the placenta, and version,—in other words, operations in which a hand or a finger is introduced into the uterus,—favor the outbreak. Retention of the placenta or parts of it has also been found in several cases.

Symptoms.—The disease may arise any time during the first month after confinement, but generally it does so before the sixth day. In rare cases it has appeared in pregnancy or during labor. It does not in any way differ from tetanus produced under other circumstances. It is characterized by tonic contractions of the voluntary muscles, intercurrent convulsions, and increased reflex irritability. It begins always at or near the neck. Sometimes *lockjaw*—inability to open the mouth on account of contraction of the masseters—is the first symptom noticed. In other cases difficulty in swallowing, produced by the constriction of the pharyngeal muscles, in others again stiffness of the neck opens the scene. The mouth is drawn so as to simulate a smile, so-called *risus sardonicus*, contrasting with the corrugated eyebrows and the general facial expression of anxiety and suffering. During a paroxysm the eyes are drawn back in their sockets and remain wide open. The pupils become much contracted and do not react to light. Whether the face becomes pale or flushed and swollen depends upon the condition obtaining in the larynx.

Soon the muscular contractions extend from the head and neck to the trunk and the extremities. As a rule, the muscles of the posterior surface of the body are more contracted than those in front, so that under a paroxysm the patient rests only on the head and the heels. Emprosthotonus is much rarer.

Generally the contractions of the muscles are painful, and sometimes there is felt a particularly severe pain in the epigastric region, which probably is due to tetanic contractions of the diaphragm. In consequence of the pain the patient commonly becomes the victim of restlessness and insomnia, but the intelligence remains unimpaired.

The temperature in most cases rises, and may even reach 107.6° F. There is especially an elevation towards evening. Exceptionally the temperature is subnormal. The sweat secretion augments. The pulse is weak and rapid.

Sometimes micturition is difficult and painful, or the bladder empties itself involuntarily. The bowels are generally constipated, but sometimes involuntary evacuations occur. As a rule, the urine does not contain albumin.

Prognosis.—Puerperal tetanus may last from a few hours to a month, but rarely over eight days. It ends nearly always fatally (of 106 patients only 12 survived). After abortion the mortality is still greater than after labor at term. The cause of death is asphyxia or exhaustion from pain and lack of sleep.

Diagnosis.—Tetanus is easily distinguished from *eclampsia*, the only common feature being convulsions. Eclampsia is commonly combined with albuminuria, and there are, as a rule, casts in the urine. In tetanus, with rare exceptions, the urine does not contain either casts or albumin. Eclampsia is usually ushered in by forebodings, such as cardialgia, headache, vertigo, œdema of face·and hands, light twitchings of the facial muscles ; tetanus comes on suddenly. In eclampsia the convulsions are clonic, or alternately clonic and tonic ; in tetanus they are tonic with exacerbations. During an eclamptic attack the patient is unconscious, and the convulsions are followed by deep coma ; in tetanus the intellect is perfectly preserved throughout the course of the disease. The tetanic convulsions may be brought on by touch, noise, or similar sensory impressions ; nothing of the kind is the case with eclampsia. In the latter disease the patient, as a rule, feels much less pain. The temperature is not so high. The pupils are dilated ; in tetanus they are contracted.

The diagnosis from *epilepsy* cannot present much difficulty either. The patient's history reveals that she is accustomed to such seizures. Often an aura is present. The contractions may at first be tonic, but soon they assume the clonic type. They are accompanied by loss of consciousness. The temperature is normal or scarcely raised. The attack lasts at most a quarter of an hour. There are long intervals between the attacks.

The differentiation from *hysteria* may be more difficult. Indeed, all the muscles of the body may become tetanically contracted by hysterical spasms. Commonly the history will disclose that the patient is subject to similar attacks. There are generally fits of laughing or crying or tossing about in the bed, or some display of an egotistical interest in the morbid phenomena, or sudden changes from one state to another, which give the disease a peculiar stamp and form a picture essentially different from that of the poor being racked by tetanus with its constant contractions, only interrupted by paroxysms in which they increase in intensity and spread to points heretofore at rest.

Tetanus must also be differentiated from *symptomatic tonic convulsions*. Local affections of the brain or cord may be distinguished by the history, want of paroxysms induced by reflex action, and the absence of periodical remissions. In affections of the nerve-centres the tetanic contraction is limited to the upper or lower extremity, and it is soon followed by paralysis of the same parts.

Cases of general excitement of the whole nervous system are characterized by a different history, a marked contrast between the most severe paroxysms and complete relaxation, and an entirely different course.

Tetanic contractions may occur in diseases in which the blood is in an abnormal condition, such as smallpox, scarlet fever, typhoid fever, pyæmia, uræmia, etc. Here the tetanic contractions appear at irregular intervals. If they are due to malaria, they are intermittent.

If tetanus is limited to certain groups of muscles, it might be confounded with tetanic contraction due to local irritation of certain nerves, but by following the course of the disease its nature will soon become clear.

Pathology.—Autopsies show hyperæmia and a diffuse growth of connective tissue in the brain, the spinal marrow, and the meninges.

Treatment.—With our present knowledge of the true nature of the disease, our treatment must first of all be directed against the invasion of tetanus bacilli. As to prophylaxis, we cannot do more than follow the general rules for aseptic and antiseptic midwifery. When the disease breaks out, tetanus-antitoxin should be injected hypodermically or into the spinal canal between the first and second lumbar vertebra (compare p. 205), or perhaps even right into the brain after trephining. It is also rational to try to clean out the uterine cavity by copious antiseptic injections. The mortality being so enormous, we may in the beginning of the disease try by vaginal hysterectomy to remove the focus of infection.

At the same time the terrible sufferings of the patient call for alleviation. Opium seems to have done little or no good. Chloroform and ether have sometimes been useful, but in other cases increased the pain. Chloral, in doses of fifteen grains by the mouth or from half a drachm to a drachm by the rectum, has given better results than most drugs. Nitrite of amyl has also antispasmodic effect and is easily given in the dose of two or three drops by inhalation. Bromides may also contribute to the patient's comfort.

On account of the hyperæmia of the central nervous system, ice-bags on the head and along the spine and cold baths are indicated. Warm baths may be used to tranquillize the nervous system. A turpentine enema may act as a useful counter-irritant. At a later stage of the disease iodides may be given in order to reduce the new-formed connective tissue.

TETANOID CONTRACTIONS.—Besides true tetanus, tetanoid contractions are found in connection with pregnancy and lactation. They differ from true tetanus by being intermittent or having an hysteric character, but they may be grave enough to cause the patient's death.

Tetany is specifically intermittent and occurs only during pregnancy or in consequence of lactation (see p. 323).

§ 4. **Eclampsia.**—We have said above that eclampsia, if it breaks out during labor, may continue for several days in the puerperium. It may also begin during this period and then generally within a few days after delivery. As to the description of the disease and its treatment the reader is referred to what has been said above (pp. 325–333).

§ 5. **Insanity.**—Since the time of Hippocrates it has been a general belief that pregnancy, parturition, and lactation are apt to produce mental disease. That psychoses are common in one of these conditions related to the propagation of mankind is irrefutable, but in order not to lay too much weight on them as etiological factors in the production of insanity we must remember that the whole cycle of pregnancy, parturition, and lactation takes from a year and a half to two years, and then ordinarily begins anew. Consequently a very large number of women between twenty and forty years of age are in one of these conditions, and it could therefore hardly be expected that we should not find a correspondingly great number of cases of insanity beginning in women in these conditions.

If child-bearing had a very marked effect on the production of insanity, there would be a much larger number of insane women than insane men; but the reports of alienists show that there is little difference in regard to frequency of insanity among the two sexes, with a slight preponderance on the male side. This is accounted for by the greater frequency of alcoholism and syphilis in men. But these two diseases could not possibly tip the scales to the male side if the physiological process of child-bearing in itself were so powerful an element in the production of insanity as it generally has been thought to be.

Nevertheless there are many features of the child-bearing process which may make the patient fall a victim to mental disease or may favor an outbreak of insanity in a person with hereditary disposition in this direction. During pregnancy the chemical composition of the blood changes, and the nervous system becomes more sensitive. Parturition is accompanied by great pain, severe congestion of the brain, and often considerable loss of blood, either before, during, or after labor. Many women, especially among those who have become impregnated out of wedlock or who are living in poverty, are apt to undergo great emotions from shame, contrition, and fear for the future.

There is no specific form of puerperal insanity that can be recognized by its symptoms, such as alcoholism or epilepsy. The clinical aspect of the disease is the same as when it occurs outside of pregnancy and the puerperal state.

From an etiological stand-point we may distinguish *idiopathic*, *infectious*, and *toxic* insanity.

Idiopathic insanity may be due to hereditary disposition or any of the weakening factors mentioned,—loss of blood, pain, or emotions. It is much more frequent in primiparæ than among those who have had children before. It begins often during pregnancy as mere sadness, which develops into melancholia with tendency to suicide. During parturition a psychical epilepsy may break out. The patient suddenly becomes very excited. Her face is flushed, the eyes are staring, her actions are impulsive and incoördinated. She may attack her friends or kill her child. This period of excitement may last for one or more hours, after which the patient falls asleep as after an epileptic attack, and when she awakes there is complete amnesia in regard to all that has happened during the stage of agitation. In some cases of this kind the patient's previous history proves that she has been suffering from true somatic epileptic attacks at an earlier period. This form has, of course, great medicolegal interest, since the culpability for the acts committed by the patient during the attack may be claimed or denied.

Excessive loss of blood may produce acute delirium with an asthenic type, like that caused by inanition. It may end in recovery after a short time, or lead to death or a secondary psychosis.

Infectious insanity is a result of puerperal infection. It may follow after local inflammatory conditions in the genitals, such as colpitis, endometritis, or salpingo-oöphoritis, as well as after serious general sepsis, especially encephalitis or meningitis. Sometimes it is due to embolism from phlebothrombosis or from endocarditis.

The attack comes generally from four to ten days after delivery. There is no prodromal stage or a very short one of mental depression. In most cases the patient has fever due to the inflammation, but the attack may also come with normal temperature. From a dull and apathetic condition the patient suddenly passes into a state of restlessness and agitation. Hallucinations of one or more senses are always present. There is incoherence of thought and action. The entire list of psychosensory and psychomotor symptoms is apt to occur without order or system.

The prognosis depends largely on the patient's physical condition. The disease may end fatally or in recovery within a short time, and the mortality is considerable; or it may lead to ordinary melancholia or mania, which may last for several months, and which also may end in recovery or in final dementia.

Toxic insanity is due to the presence of a poison in the blood, especially to uræmia, which may be allied to eclampsia or not. Immediately or a day or two after the patient awakes from the sopor following the eclamptic attack, her mental faculties are unbalanced. She has no fever, but suffers from hallucinations, some restlessness, and a tendency to melancholy. This condition lasts only from one to three days and always ends in recovery.

Lactation as such plays no *rôle* in the production of insanity. The greater tendency to nervous and mental disease found during the first few months after delivery finds its natural explanation in the other causative elements we have mentioned above. The psychoses observed at this time have nothing specific in their clinical features. They are the same as might occur in any other woman at any other time. It is unlikely that the milk has any deleterious effect on the child, but since lactation is a drain on the mother's strength, it should be discontinued.

Treatment.—A question of paramount practical importance that presents itself to the obstetrician is whether in a case of insanity developed during pregnancy the latter shall be allowed to go on or shall be interrupted. Since nowadays less influence on the production of insanity is attributed to the pregnant condition than formerly, some think that the presence of pregnancy in itself is not sufficient to warrant the induction of artificial abortion. But even these approve of it when the patient loses strength and flesh, or if she must be forcibly restrained, or if it is necessary to feed her with the stomach-pump. Personally I do not share their opposition to recourse being had to abortion. It appears to me that, even apart from the question whether or not anything is to be gained in regard to the curability of the mother's insanity by interrupting her pregnancy, it is better to do so in the interest of the child and society. Knowing how hereditary a disease insanity is, it is humane not to expose the child to be born with such a burden, and it is justifiable to spare the human race from an addition to its membership of such doubtful value.

During labor the obstetrician will watch the patient and restrain her from doing any harm to herself or others, especially her child. After labor he should as soon as feasible place the woman in an asylum, where she can be under the care of physicians with special training in the treatment of mental disease. But before this can be done there are duties for the obstetrician to perform towards the unfortunate person. If there has been great loss of blood, subcutaneous or intravenous injection of normal salt solution is indicated. It is, furthermore, of the greatest importance to feed the patient. In this direction something may be obtained by rectal alimentation, but it is not sufficient under the given circumstance. If the patient refuses to take nourishment, she must, therefore, be methodically fed by the stomach-pump.

If the insanity is due to infection, the obstetrician will have to treat this as he would do under ordinary circumstances; but at the same time he should pay special attention to the patient's nervous system. Her excitement may perhaps be soothed by a wet pack or a warm bath. If she is feverish, ice-bags applied to her head and spine or sponging with alcohol and cold water may be useful. Psychosensory irritation calls for opiates. The psychomotory is quieted by hydrobromate of hyoscine (gr. $\frac{1}{100}$—0.6 milligramme—hypodermically or gr. $\frac{1}{50}$—1.2 milligrammes—by the mouth).

In cerebral congestion ergotine is sometimes valuable.

In the restless form it is of great importance to produce sleep, for which unusually large doses of hypnotics may be required. Trional or sulphonal may be given in doses of gr. xxx (2 grammes), paraldehyde in doses of ʒii (8 grammes) or even ʒiiss (10 grammes).

CHAPTER VIII.

ERUPTIVE FEVERS.

Scarlet fever is a rather rare complication of childbirth. Sometimes the exposure seems to have taken place at a comparatively remote date, and it makes the impression as if the infection had been kept back but was furthered by the occurrence of childbirth with its inevitable wounds in the genital canal, through which the infecting agent probably gains access to the interior of the body. This belief is based upon the fact that often the redness first appears on the vulva, that the vagina frequently shows diphtheritic infiltration, that there commonly is found pelvic inflammation, and that, on the other hand, the throat, as a rule, is much less affected than when the disease is acquired in the common way, which probably is by inhalation.

It has also been noticed that the incubation is unusually short in puerperal scarlatina. Whereas ordinarily there pass from five to seven days between the exposure and the outbreak of the disease, puerperal scarlatina generally appears in one or two days. The redness shows soon, is unusually dark, and spreads rapidly over the whole body.

The germs of the disease, like those of puerperal infection, may be brought on the hands of physicians or nurses, on dressing material, or through the air. Puerperæ do not seem to be particularly apt to catch the disease, otherwise it would be more commonly observed in them; and if a case appears in a lying-in hospital no great difficulty is experienced in preventing or limiting its spread.

Prognosis.—Scarlet fever is a serious complication of the puerpery. The lochial discharge and milk secretion often stop. There is a tendency to hemorrhage. The convalescence is tedious and the mortality considerable.

Diagnosis.—Puerperal infection can, as we have seen above (p. 718), give rise to a rash which resembles that of scarlet fever, and if the patient dies soon the diagnosis may be doubtful. Otherwise we usually have no great difficulty in making the diagnosis, in which we are guided by the following points. The history of the case may bear evidence of exposure to infection. The peculiar uniform redness is diffused over the whole body. A similar color is found in the throat. The tongue looks like a strawberry. There are frequently diphtheritic exudations in the throat or in the vagina. The eruption is followed by a wide-spread and protracted, often repeated, desquamation. The kidneys often become inflamed, the urine containing albumin and casts. If the child or another person who approaches the patient became similarly affected, it would be strong evidence in favor of the patient's ailment being scarlet fever.

Treatment.—The patient should at once be isolated, and, since the child is apt to catch the disease, nursing should be discontinued. Otherwise the case should be treated according to general rules for both the puerperal condition and the scarlet fever.

MEASLES and SMALLPOX are rare in puerperal women, and do not offer any peculiarities, except that like all eruptive fevers they have a tendency to cause hemorrhage.

ERYSIPELAS is not so very rare, and it is a dangerous complication of the lying-in period. It ordinarily starts from the genitals or the breasts (p. 765).

The identity of the streptococcus found in puerperal fever and that of erysipelas has been mentioned above (p. 691), and likewise the similarity between the far-spreading cellulitis of puerperal infection and the inflammation extending all over the skin in erysipelas (p. 703).

TYPHOID FEVER is not rare either, and has an unfavorable influence on the puerperal state.

In all eruptive fevers nursing should be discontinued.

CHAPTER IX.

OTHER FEVERS.

Malarial Fever.—True malaria may attack a woman in the puerperal state, and there is even greater susceptibility to the malarial poison in this condition than outside of it. But there is no doubt that many practitioners lay the blame for illness occurring after childbirth on malarial infection, while in reality it is due to puerperal infection and sepsis. From a practical stand-point it is much safer, when there is any doubt, to treat the case as puerperal. For the diagnosis of malaria the presence of the plasmodium in the blood should be demonstrated. If the intermittent type is pronounced, that is an important diagnostic point; but often the fever is continuous or more remittent.

Malaria, like the eruptive fevers, is apt to cause hemorrhage, and occasionally the disease may appear in its most serious forms.

During the attack of fever the milk secretion ceases altogether, and in the interval it is diminished. Whether the disease can be communicated to the child through the milk is an unsettled question.

In women who had malaria before confinement, it is apt to come again after the birth of the child, in most cases on the third day.

Unusually large doses of quinine may be needed to check the fever. It is best to give it in full doses of fifteen grains or more, repeated, if necessary, three times a day or oftener. Since it does not pass into the milk, it is safe to continue lactation.

A moderate fever is quite frequently due to *constipation*, and vanishes as soon as the bowels are moved. In many cases it is due to *sore nipples* or *mastitis*. In others again it is of *emotional* origin. Perfect quiet should therefore reign in the lying-in room, and the patient should be carefully guarded against all unpleasant or violent impressions.

PART V.—NOTES ON DISEASES OF NEW-BORN CHILDREN.

CHAPTER I.

DISEASES OF THE NAVEL.

The navel, offering a suppurating sore, often becomes a starting-point of disease in the new-born child.

§ 1. **Umbilical Fungus.**—Ordinarily the granulating surface left where the cord has fallen off heals within two weeks after the birth of the child. Sometimes, however, this does not take place, and it continues to secrete a purulent fluid. On examination a small mushroom-shaped granuloma—a so-called *umbilical fungus*—is found to spring from the site of the umbilical cord. It is nearly always more or less pediculated, and sometimes contains remnants of the omphalo-mesenteric duct in the shape of a fine canal covered inside with a single layer of columnar epithelium. Sometimes the umbilical vessels resist decay longer than the surrounding softer tissue of the stump of the cord, forming a little penis-like protrusion. This little growth goes on secreting indefinitely, but the cure is as simple as it is effective. A silk thread is thrown around the base of the tumor and tightened. In a few days it falls off, and the base is rapidly covered with epidermis.

The umbilicus may also continue to secrete pus without the formation of a tumor—*umbilical ulcer*. It should be cleaned with saturated solution of boric acid or Thiersch's solution and dressed with salicylic acid or benzoate of sodium mixed with amylum or talcum (from forty to twenty parts).

§ 2. **Hemorrhage.**—We have recommended (p. 196) to tie the cord with a bow and reinspect it before leaving the house in order to satisfy ourselves that there is no oozing through the umbilical vessels. But later there may be loss of blood from the area of separation between the perishable and the permanent portions of the stump. This is particularly liable to happen if the stump is cut long and gets dry, or if the dressing is torn off without soaking it. The accident has most often happened in children affected with hereditary syphilis.

Perhaps a touch with a stick of lunar caustic, a 20 to 50 per cent. solution of ferripyrin, or the application of the dry extract of suprarenal capsule substance may suffice to stop bleeding. If it does not, two harelip-pins should be passed crosswise through the umbilical cone and a ligature applied around them.

If the child is suffering from hæmophilia, congenital syphilis, general sepsis, or acute fatty degeneration, even this mechanical hæmostasis may be futile, since new bleeding starts from the pinholes. Sometimes plaster of Paris has proved successful and in other cases the actual cautery. Persalts of iron should be avoided, as they form hard scabs under which moisture accumulates and gives rise to sepsis.

§ 3. **Umbilical Arteritis.** — Sometimes the umbilical arteries in their course between the bladder and the umbilicus remain pervious, and the suppuration extends from the stump through these vessels. By pressure along the arteries up towards the umbilicus it may be possible to press out a little pus. The surrounding connective tissue of the abdominal wall may also become inflamed—*omphalitis*—forming a subcutaneous abscess or a deep one which lies in direct contact with the peritoneum. Such abscesses should be laid freely open and dressed with the above-mentioned mild antiseptic solutions. Carbolic acid, bichloride of mercury, and iodoform are too dangerous. At a later stage, bismuth, oxide of zinc, or dermatol may be used.

§ 4. **Umbilical phlebitis** is rarer than umbilical arteritis, but also much more dangerous.

All these umbilical inflammations are due to the entrance of streptococci and staphylococci from the umbilicus. The infection may take a *septic* or a *pyæmic* form. In the former there is a general dissolution of the blood, vomiting, swelling of the abdomen, pain, and great sensitiveness, due to peritonitis which rapidly ends in death. In the pyæmic form the prognosis is somewhat better. Thrombi and abscesses are formed in different parts of the body, but after they have been opened and have healed, the child may ultimately recover.

§ 5. **Gangrene.** — In bad cases of umbilical inflammation the anterior abdominal wall may become *gangrenous*. Then dead tissue should be removed with knife or scissors, the wound dressed antiseptically, and the flagging strength increased by the administration of alcohol (1 or 2 teaspoonfuls of whiskey in the 24 hours, diluted with eight times as much water and sweetened with sugar.)

CHAPTER II.

PUERPERAL INFECTION.

INFECTION does not always start from the navel. As we have seen above (p. 694), it may also enter through sores in the mouth or accidental wounds; or it may come from decomposed liquor amnii or meconium which the child aspires into its lungs if it begins to breathe while it is still in the uterus; or it may be due to breathing infected air. It may even be acquired from the mother before birth, microbes perforating and passing through the normal partition between the maternal and fetal organisms.

General septicæmia is nearly always fatal. We may often prevent the disease by following the rules of antisepsis. The child should be kept clean. The navel should be dressed antiseptically. The room should be well ventilated. The person who takes care of the mother and child during the lying-in period should always disinfect her hands before manipulating the child, and should attend to the child before touching the mother. The child should not lie in the same bed with the mother.

If infection takes place and is localized, it should be treated by antiseptic applications. Abscesses should be opened and dressed. The only internal remedy of any value is alcohol.

CHAPTER III.

GONORRHŒAL INFECTION.

§ 1. **Ophthalmia Neonatorum.** — Ophthalmia of the new-born child, or *ophthalmoblennorrhœa*, is a purulent conjunctivitis produced by the entrance of the gonococcus of Neisser into the conjunctival sac. As a rule, the infection takes place while the child is being pressed through the vagina and vulva of the mother; or, after delivery of the head, if it hangs down into the collection of blood, mucus, and liquor amnii accumulated upon the couch, between the thighs of the mother; or, if the child dips its hands into this unwholesome lake or against the maternal genitals, and then carries them to its eyes.

The infecting agent may also be carried from one patient to another by doctors, midwives, or nurses; or the disease may be acquired in a bath, if the same water is used for several children.

Much more rarely the child already has the diplococci in its eyes when it leaves its mother's body. This is possible only in cases in which the bag of waters ruptured several days before delivery, thus allowing the microbes to be carried into the uterus.

The incubation lasts two or three days. Then the eyes begin to swell, and a serous fluid mixed with a few purulent flocculi distils from the slit between the eyelids. If left to themselves, in another couple of days the swelling becomes so great that the child cannot open its eyes; and the discharge becomes thick, creamy, greenish-yellow pus. Next, the cornea becomes opaque, a perforation takes place, and the eye collapses and atrophies. As a rule, both eyes become affected.

The disease used to be very common. In a service of only thirty-five births a month we had frequently half a dozen cases of ophthalmia on hand in Maternity Hospital. In other institutions from 7 to 12 per cent. of the children were thus affected.

If neglected the disease generally ends in blindness. According to large statistics, from one-third to two-thirds of the inmates of institutions for the blind had acquired their dreadful calamity from this source.

All this has been changed since Credé's great discovery that in silver nitrate we have an almost absolutely sure prophylactic against gonorrhœic ophthalmia. During the first twelve months after I introduced this treatment in Maternity Hospital, 351 children were born alive. All had the silver treatment, and not a single one got inflammation of the eyes in a service full of women from the very lowest strata of the city, many of whom doubtless were affected with old or recent gonorrhœa. A single child, through the negligence of an assistant, was not treated, was attacked by ophthalmia, and, although put under the care of able physicians in the eye department, lost the sight in both eyes. This has made such a deep impression on me that I am inclined to ascribe the rare cases that yet are reported not to unreliability of the remedy, but to unfaithfulness in its use. Withal only one-half of one per cent. or less cases are nowadays reported from lying-in hospitals.

Others have recommended bichloride of mercury (1 : 2000), or argonin (5 per cent.). Protargol (10 per cent.) used in the same way is said to be as effective as nitrate of silver and less irritating.

The *diagnosis* offers no difficulty. No other inflammation of the eyes is characterized by such an enormous swelling and such profuse discharge of thick pus. Besides, bacteriological examination shows the presence of the diplococcus in the interior of the pus-cells.

Treatment.—In regard to prophylaxis enough has been said in speaking of the conduct of normal labor (p. 209). Here I shall only add that it may be well to bandage the child's eyes immediately after it is delivered and to keep the head away from the pool in front of the maternal genitals. Of still greater importance is it, when only one eye is affected, to apply a monoculus to the healthy eye; but then this must be inspected daily and taken under treatment as soon as it shows signs of beginning inflammation.

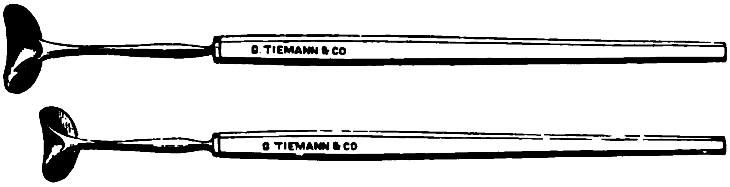
The curative treatment consists in ice, boric acid, and silver, but it is so troublesome that at least two nurses are needed to treat one child. The eyes should be covered with small, fine ice-bags (condoms, which may be obtained from rubber manufacturers under the innocent name of "protectors for two fingers"). This is much easier than to place pieces of lint on a block of ice, apply them to the eyes, and change them as often as they become warm, which is almost instantly. Every hour, day and night, the eyes are thoroughly cleaned with a saturated solution of boric acid, which is made to fall in a copious stream right into the eye by spreading the eyelids apart and squeezing in front of the eye a wad of absorbent cotton soaked in the solution. The third measure to be taken is the use of strong nitrate of silver solution to kill the gonococci. For this purpose the same treatment may be used as we have described for the prevention of the disease. A drop of a 2 per cent. solution should be dropped into the eye and moved all around. Another, and perhaps better, way is once a day to evert the eyelids and paint the inside with a camel's-hair brush dipped in a 10 per cent. solution and then pour salt solution over them in order to neutralize the redundant silver solution. The physician may improvise the salt solution by dissolving half a teaspoonful of table salt in a wineglassful of water. A teaspoonful of this solution is poured over each eye.

If there is any opacity of the cornea, the iris should be dilated by dropping three or four times a day a solution of sulphate of atropine (1 : 150–200) into the eyes. If an ulcer forms on the cornea, ice should be discontinued.

When the violent inflammation has subsided, milder astringent solutions, such as silver nitrate (1 : 500–1000), are required.

In order to be able to act in time, it is absolutely necessary to see the cornea every day. If the eyelids are very swollen and stiff it may be impossible to expose the bulb with the fingers alone. Under such circumstances the writer has found Desmarre's retractors excellent (Fig. 502.)

FIG. 502.



Desmarre's eyelid retractors.

The result of the treatment is so doubtful that, whenever possible, the obstetrician had better, in his own interest as well as in that of the patient, turn the case over to an oculist.

As a rule, the friends have no idea of the nature of the disease or its gravity. The wise old women ascribe it to a cold, and a favorite remedy is to wash the eyes with the mother's milk. If the physician does not see the child after its birth, he should leave strict orders to send for him immediately if its eyes become inflamed.

§ 2. **Gonorrhœal Stomatitis.**—The gonococcus may find its way into the mouth of the baby, where it causes a wide-spread, superficial, purulent inflammation. The mucous membrane becomes intensely red, the epithelium is affected and thrown off, but the general health does not seem to suffer. The disease ends within four or five weeks in recovery.

Treatment.—The mouth should be swabbed hourly with saturated solution of boric acid, and painted with argenti nitras (gr. i to ℥i—6 centigrammes to 30 grammes) three times a day. The eyes should be closely bandaged and carefully watched, lest with its fingers the child bring the infecting agent to them from its mouth.

§ 3. **Gonorrhœal Ædœocolpitis.**—In rare cases the vulva and vagina of new-born girls become infected with the gonococcus, which produces redness and purulent discharge.

Treatment.—A soft-rubber catheter should be introduced to the fornix vaginæ and the canal irrigated three times a day with a quart of a 1 : 3000 solution of permanganate of potassium. Other remedies that have been recommended for injection are corrosive sublimate (1 : 5000) and nitrate of silver (2 per cent.).

CHAPTER IV.

DISEASES OF THE MOUTH.

§ 1. **Sprue.**—*Sprue*, *thrush*, or *muguet* is an inflammation of the mouth due to the presence of a fungus called *oïdium albicans*, or *saccharomyces albicans.* The disease appears generally in the first or second week of the puerperium. First the whole mucous membrane of the mouth becomes dark red, and the following day small, round, white elevated spots appear on the inflamed mucous membrane. These spread and coalesce, forming irregular white patches, which adhere more or less firmly to the flesh. These masses are composed of oïdium, streptococci, staphylococci, fibrin, curdled milk, epithelial cells, and detritus. The fungi penetrate deep into the epithelium, and, therefore, resist removal.

The same fungus is found in the chafed surface of the nates of babies and often in the vagina of women. It may extend into the œsophagus and its gonidia are found in the gastro-intestinal tract. More rarely it invades the larynx. It has even caused embolism in the brain and the kidneys.

Etiology.—The disease is largely due to lack of cleanliness. Intestinal disturbances favor its outbreak. It is more common in bottle-fed children than in those who are brought up on breast-milk.

Symptoms.—The child becomes restless, loses appetite and weight; sucking is painful; not rarely diarrhœa sets in. Sometimes the child becomes hoarse and may develop a pneumonia.

Prognosis.—If taken in time the disease is easily eradicated. If neglected, it may lead to diarrhœa, exhaustion, pneumonia, and death.

Treatment.—The preventive treatment consists in washing out the mouth frequently, especially after feeding, with a soft rag and plain cold water. When the white spots and membranes have appeared, the first thing to do is to rub them off with a rag dipped in an acid wine or vinegar and then to paint the inside of the mouth after each nursing with

℞ Sodii boratis, ʒi (4 grammes);
Glycerini, q. s. ad ℥i (30 grammes).

With this simple treatment I have always seen the disease disappear in a few days. Other remedies that are recommended are the saturated solution of boric acid, permanganate of potassium (from one-half to one per cent.), or nitrate of silver (gr. i to ℥i—6 centigrammes to 30 grammes), all used for swabbing the mouth five or six times a day. When there is diarrhœa the following formula may be used:

℞ Bismuthi subnitrat., gr. xv (1 gramme);
Resorcin, gr. v (30 centigrammes);
Glycerini, ʒii (8 grammes);
Aquæ dest., q. s. ad ℥ii (60 grammes).—M.
Sig.—Shake well. A teaspoonful every two hours.

§ 2. **Bednar's Aphthæ.**—Bednar's aphthæ are flat, circular ulcers of the size of a lentil, generally found symmetrically on both sides of the hard palate, in the region of the hamular process of the sphenoid.

The mucous membrane is here only half as thick as in the other parts of the mouth. The pterygomaxillary ligament extends from the hamular process to the spine in which the internal oblique line ends on the inside of the lower jaw, and it stretches this part of the mucous membrane when the mouth is opened. As the hamular process forms a prominence, the back of the tongue is pressed with particular force against it when the child nurses. When we open the mouth of the child, we can see this spot blanch and become anæmic. All this explains why these two spots are more vulnerable than the other parts of the mouth.

To this anatomical and physiological predisposition may come traumatic injury, if an energetic and overzealous nurse sees the anæmic places and takes them for sprue, which she endeavors to rub off.

Trifling as the disease is in itself, it acquires importance by making sucking painful, and thus interfering with the nutrition of the child.

The ulcers are easily cured by abstaining from injuring them and by painting them with the above-mentioned borax solution. Exceptionally the solutions of nitrate of silver or permanganate of potassium may be required.

As a preventive of this and other buccal affections it is well to clean the mouth by giving the baby a few teaspoonfuls of water after each meal.

§ 3. **Injury to Epithelial Pearls.**[1]—In the mouths of nearly all new-born children—in 53 out of 57 examined by me for the purpose, or 93 per cent.—are found so-called epithelial pearls. These are small, white, globular tumors, varying in size from that of a pin-head to that of a millet-seed, situated in the raphe of the palate, preferably at the juncture of the hard and the soft palate. Sometimes there is only one such pearl, in other cases from two to five. The outer surface is almost cartilaginous, while the interior is filled with a softer mass. They are embedded in the mucous membrane of the mouth, the larger reaching from the epithelium, in which they may even produce a depression, to the periosteum. Most of them have a covering of condensed subepithelial connective tissue, which merges into the surrounding tissue without any distinct line of demarcation. Sometimes, instead of the round prominence, we find a white line extending as much as half an inch in the direction of the raphe.

Microscopical examination shows that the whole mass is composed of epithelial cells, like those of the mucous membrane of the mouth. The outer layers are the youngest, as appears from their polyhedral form and the presence of a nucleus; while those placed near the centre are flat and have lost their nuclei, just as the case is with the older, superficial epidermal cells compared with the younger of the rete Malpighii.

Similar formations are sometimes found on the free edge of the alveolar process, especially near the posterior extremity.

They are transient growths, which in healthy children soon disappear. In our cases the pearls, if they did not give rise to stomatitis, disappeared within one or two weeks. Several nodules were seen to coalesce and then to clear up and gradually disappear. New ones may appear after the birth of the child. In badly nourished children the involution takes more time.

These little growths are due to an invagination of the epithelium which takes place where the two halves forming the palate come together and unite in the median line from the front backward, and likewise on the alveolar process when the walls of the dental furrow grow together over the rudiments of the future teeth.

---

[1] Garrigues, "Stomatitis due to Irritation of Epithelial Pearls in the Mouths of New-Born Children," Trans. Amer. Gyn. Soc., 1892, vol. xvii., Medical News, Oct. 1, 1892.

If these pearls are injured in washing the mouth with a coarse cloth or too roughly, they become inflamed and give rise to superficial ulcers covered with a yellow film and bounded by a red line. The ulceration extends symmetrically from the median line and may occupy the whole soft palate. Microscopical examination of the yellow substance covering the ulcer shows only pus-corpuscles and the usual pyogenic microbes. The general health of the children remains undisturbed. In 1892 we had quite a little epidemic in Maternity Hospital from this cause. Of 27 babies whose mouths had been washed immediately after their birth and after each meal, with the velvety side of a piece of lint soaked in a saturated solution of boric acid, 12 had more or less sore mouths. In the next twenty-five cases we desisted from all washing of the mouths, so that nothing but the mother's nipple and her milk entered. Of these not a single one was affected.

Diagnosis.—Epithelial pearls are easily recognized by their definite localization and their globular shape. The ulcers differ from *Bednar's aphthæ* by their locality. Bednar's ulcers are always placed laterally, and usually bilaterally, whereas those caused by epithelial pearls are central. *Sprue* forms small, irregular, less elevated white spots, which are never congenital, may be found anywhere, and have no symmetrical development.

The ulcers are due to mechanical injury in cleaning the mouth.

The *treatment* consists in discontinuing ablutions of the mouth and in painting with borax glycerin.

CHAPTER V.

GLANDULAR SWELLINGS.

§ 1. **Mastitis.**—It is not rare that the mammary glands of newborn children—male as well as female—become inflamed. The little gland then forms a painful, hard protrusion, out of which can be pressed a white fluid which in chemical composition and microscopical appearance is like colostrum. As a rule, the swelling subsides in a few days, but it may also suppurate, and the pus may perforate the capsule and spread under the skin. This suppuration is accompanied by high fever and may end fatally.

Treatment.—The swollen breast should be covered with a flax-seed-meal poultice. If an abscess forms, it should be opened with a lancet, washed out, and dressed with a saturated solution of boric acid or Thiersch's solution. If the suppuration has spread into the connective tissue, it may be necessary to make several incisions, drain, and remove shreds of mortified tissue. At the same time the little patient should have a teaspoonful of a mixture of one part of brandy or whiskey with four parts of water every one or two hours and half a grain of quinine three times a day.

§ 2. **Hypertrophy of the Thymus Gland.**—The thymus gland is a temporary organ which reaches its greatest size at about the end of the second year of life. It is an elongated body situated partly in the thorax and partly in the lower region of the neck. It lies just behind the sternum and in front of the pericardium, the large vessels, and the trachea. It reaches from the lower end of the thyroid body to the fourth-rib cartilage. At birth it measures about two inches in length, an inch and a half in width, and an inch and a quarter in thickness. It is composed of two lateral lobules. It is a vital organ, and its rôle is probably to contribute to the formation of blood.

This organ may be hypertrophied and give rise to serious and even fatal dyspnœa by pressure on the trachea, the pneumogastric, or the recurrent nerve. The diagnosis is based on the protrusion of a tumor in front of the trachea during expiration. A cure has been effected by the surgical removal of portions of the tumor.

CHAPTER VI.

SKIN DISEASES.

After having been suspended in a serous bath of uniform temperature during the whole duration of pregnancy, the new-born child comes in contact with air, with water, with clothes, and with alvine and vesical evacuations. No wonder, then, that its skin easily becomes inflamed.

§ 1. **Erythema** is very common. As a rule, it is accompanied by desquamation of the epidermis—*intertrigo.* The buttocks, part of the posterior surfaces of the thighs, the external genitals, and the genitofemoral and inguinal furrows become chafed, and show large, red areas deprived of epidermis.

The chief cause is lack of cleanliness or rough handling.

A similar condition on a smaller scale is sometimes found in the armpits or the furrows of the neck, where it probably is due to perspiration. It is especially found in fat children. Intertrigo may produce diarrhœa, and, on the other hand, it gets worse from the acrid intestinal discharge.

The dermatitis causes pain and deprives the child of sleep.

As to *treatment*, the first thing required is scrupulous cleanliness.

The child should not be allowed to lie in its urine and fæces, as is often the case among the lower classes, but should be washed with a soft sponge and lukewarm water after every evacuation. The skin should not be rubbed dry, but absorbent cotton or soft old linen should be pressed against it to soak up the moisture. If the derma is denuded, the red surface should be painted with

℞ Acidi tannici, ʒij (8 grammes);
Glycerini,
Aquæ destill., āā ℥i (30 grammes).

The mother should, however, be warned that this stains linen, and that therefore only the necessary number of diapers should be sacrificed for this use.

If the skin is only red, but not excoriated, it should be dusted with

℞ Zinci oxidi, ʒi (4 grammes);
Amyli, ℥i (30 grammes).

Other remedies recommended are lanolin, vaseline, sweet oil, and cold-cream.

§ 2. **Eczema.**—Sometimes the scalp of new-born children becomes the seat of a vesicular and pustulous eruption on a red ground. The vesicles and pustules coalesce, rupture, and are replaced by crusts, which together with seborrhœa and dust may form a cap nearly covering the whole scalp.

The laity call this a *milk-crust* and think it should not be touched; but this is a mistake. The proper thing to do is to cover the affected part with a piece of lint soaked in a mixture of equal parts of lead-water and thin oatmeal gruel, which is renewed when it gets dry,—that is, three or four times a day. This softens and loosens the crusts, and the nurse may help a little with the nail of her little finger to get them removed. When they are gone, the skin should be rubbed twice a day with lead ointment (p. 764).

When the skin is healed, it may be strengthened by the application of the above-mentioned zinc-starch powder.

§ 3. **Miliaria; Pemphigus.**—The epidermis may be raised into vesicles filled with a serous fluid. In MILIARIA, OR HYDROA, large parts of the body are covered with small white vesicles of the size of pin-heads or millet-seeds. This eruption is probably due to profuse perspiration. The child should be lightly covered and the affected parts dusted with zinc-starch powder.

PEMPHIGUS NEONATORUM.—Pemphigus consists of a smaller number of larger vesicles. This disease is much more common in nurselings than in adults. It is not congenital, but appears a few days after the birth of the child as vesicles varying in size from that of a pea to that of a hazel-nut. The eruption may occur on any part of the trunk or extremities, but rarely on the inside of the hands or the soles of the feet. After the rupture the skin is red and shows the collapsed epidermis. As a rule, there is only one eruption, and the disease ends in recovery within a fortnight. But if the eruption is widespread and gives rise to suppuration or furunculosis, the child may become feverish, whereas ordinarily the general health is little affected by the disease.

It is contagious, and may be carried from one child to others by doctors, nurses, and midwives. A microbe much like the *staphylococcus aureus* has been found in the fluid and successfully inoculated.

A similar eruption may be of syphilitic origin, but then it is congenital, is situated on the palms of the hands and the soles of the feet, and is of much greater importance than pemphigus vulgaris.

Treatment.—A tablespoonful of boiled starch is added to the bath. The skin is dusted with zinc-starch powder and denuded surfaces dressed with pieces of muslin smeared with a mild ointment, such as

℞ Acidi borici, 1 part ;
Unguenti vel petrolati mollis, 6 parts.

Of internal remedies arsenic is most recommended, but iron and quinine may also be useful.

§ 4. **Erysipelas.**—Erysipelas, which used to be seen frequently among the children in lying-in hospitals, has, thanks to antiseptic midwifery, become a rare occurrence.

The disease is contagious and may be brought from one person to another. It enters only through a wound, but in the new-born child there is always a wound at the navel and often surfaces denuded by intertrigo. These are also the common places of entrance of the poison, but a scratch with a pin or a nail may just as well furnish the opening necessary for admittance. From the point first affected the disease may spread more or less. The issue is generally fatal.

Treatment.—The child must be isolated and fed artificially. Numerous remedies are recommended, which always throws doubt upon their efficacy. Some limit their efforts to giving comfort by covering the skin with dry cotton or with compresses dipped in astringent and cooling solutions, such as the lead and opium wash or a solution of sulphate of copper or chloride of ammonium (1 per cent.). But since it is known that the disease is due to the invasion of the *streptococcus erysipelatis*, an antiseptic treatment is rational. The skin may be dusted with

℞ Acidi salicylici, ʒi (4 grammes) ;
Zinci oxidi, ℥i (30 grammes) ;
Amyli, ℥iij (90 grammes).—M.

Carbolic acid may be used in a 2 per cent. watery solution or mixed with absolute alcohol (from 10 to 15 parts), on lint covering the inflamed part, or mixed with a similar amount of oleic acid for rubbing into the skin a little outside of the line of demarcation several times a day. But children are very sensitive to carbolic acid. Whenever it is used the urine should be examined frequently, and as soon as it becomes dark and smoky this remedy should be discontinued.

Bichloride of mercury (1: 2000) may also be used for washing the affected surface and in permanent application.

A good way of using the corrosive sublimate is in this solution:

℞ Hydrargyri chloridi corrosivi, gr. ij–iv (12–25 centigrammes) ;
Tincturæ benzoini compositæ, ℥i (30 grammes).

This is painted over the whole affected surface and a finger's breadth beyond every few hours. It forms a pellicle which in itself may contribute to the cure by excluding the air.

Absolute alcohol may be painted over the inflamed surface at similar intervals.

All applications should either be used outside of the line of demarcation or, if used on the inflamed surface, they should extend an inch beyond it, so as to stop the propagation in continuity.

§ 5. **Congenital Ichthyosis.**—Ichthyosis is a disease characterized by the thickening of the epidermis, the increased number of sebaceous glands, and the hypertrophy of the papillary layer of the corium. It is sometimes hereditary.

In the lower degree—*xeroderma*—the epidermis has a dry and grayish appearance, and is divided by numerous furrows into small scales. In the higher degree the epidermis forms a horny cuirass, which may cover the whole body and is interrupted by deep furrows, especially corresponding to the flexor side of the joints. The epidermis is yellow and the furrows bright red, sometimes bleeding. The eyes and mouth are surrounded by red protuberances, which give the child a horrid appearance.

The milder degree is curable; the severer one soon ends in death.

Treatment.—Protracted warm baths, inunctions with cod-liver oil, lanolin, or other fatty substances, to which may be added ichthyol (5 per cent.), and wrapping up in cloths soaked in the same, give relief and may in the mild form produce a cure. Internally arsenic is recommended.

§ 6. **Sclerema.**—Sclerema begins as an œdema of the feet and calves, but extends in the course of a few days to the abdomen, the upper extremities, and the face. The skin and the subcutaneous adipose tissue become stiff, hard, and cold, so that they cannot be folded. In the beginning they retain impressions as other œdematous surfaces, but later they become as hard as a board. In places the skin becomes fissured. The limbs become immovable. The eyes are half closed and the mouth is diminished. The color is in some places pink, but mostly deathly white, with bluish toes.

The temperature diminishes several degrees daily and may sink to 90° F. or lower. This combination of cold, stiffness, and paleness gives the body the appearance of a frozen corpse. The respiration is shallow, the pulse slow (60–75 beats per minute). The child is somnolent, whimpers, and cannot suck.

Etiology.—The disease is most often found in premature or weak children. Sometimes there are faulty persistent communications between the large blood-vessels or between the two sides of the heart. In other cases the disease joins hydrocephalus or meningeal hemorrhage, pneumonia, or diarrhœa. Perhaps the origin is to be sought in weakness of the respiratory muscles, in atelectasis of the lungs, or in injury to the heat-producing centre.

The *prognosis* is bad. Generally death occurs between the second and tenth days. Recovery is rare.

Treatment.—If breathing is defective, the child should be made to cry aloud. It should be kept warm by means of hot-water bottles, hot bricks, flat-irons, or lids from the kitchen range, all properly wrapped up and kept at such a distance that the skin is not burned. Massage with warm oil, vaseline, or lanolin and passive movements are indicated in order to combat the œdema and stiffness. Since the child cannot nurse, it must be fed with a teaspoon or a dropper. Protracted and frequent warm baths, to which may be added sea-salt, are useful. A mild galvanic current may perhaps favorably impress the case if it is of neurotrophic origin. Stimulants, such as whiskey or brandy (4 to 6 drops in a teaspoonful of water every half-hour), tincture of digitalis (1 drop every one or two hours), or aqua camphoræ (10 drops every hour), are also indicated.

CHAPTER VII.

DISEASES OF THE DIGESTIVE ORGANS.

§ 1. **Colic.**—When the child cries, the most common explanation is that it is hungry. If that is so, it will stop crying when fed. But most new-born children, those who nurse as well as the bottle-fed, suffer from time to time from pain in the bowels, which they show by making faces, sometimes much like a smile, and by drawing up their knees. An excellent remedy for this is—

℞ Spts. ætheris co., ʒss (2 grammes);
Tinct. rhei, ʒiii (12 grammes).—M.

Sig.—Seven drops to be administered in a teaspoonful of sweetened water four times a day.

§ 2. **Constipation.**—Normally a new-born child ought to have three or four pultaceous yellow movements a day. But not infrequently they have only one hard movement daily, or even less. The expulsion of this causes pain, and sometimes even a little blood streaks the hard lumps. The abdomen is often hard and tense.

If the child is bottle-fed, we have already indicated some changes to be made in the composition of its food (p. 251). If laboratory milk is used, the amount of casein should be reduced to one per cent. or less and the amount of fat increased. If possible breast-milk should be substituted for artificial food. But even that may not have the right composition. If the nurse has a thick, white milk, much may be gained by getting another with thin bluish milk.

If the mother or nurse is constipated too, she should above all be treated, and a daily small dose of sodium sulphate (about a teaspoonful in a tumblerful of water) should be taken on an empty stomach in the morning.

A piece of white Castile soap as large as the third phalanx of an adult's little finger may daily be inserted into the rectum of the child, or a similar portion of a glycerin or gluten suppository may be used instead. If that does not suffice, half a teaspoonful of castor oil with a little sugar spread over the top may occasionally be given with good effect. Calcined magnesia (gr. i–ii—from 6 to 12 centigrammes) may be given from three to six times a day. Pulvis rhei compositus, which contains magnesia, is still more effective. The rhubarb may also be given in the shape of syrup.

Massage may be used to advantage either by simple friction of the abdominal skin with the flat hand or by kneading the whole colon, beginning at the cæcum and following the ascending, the transverse, and the descending colon, and repeating this circular movement for several minutes three times a day.

If the constipation is due to defective peristaltic movement, this may be increased by means of electricity. The galvanic current is said to work better than faradism. The negative pole should be inserted into the rectum and the positive be moved along the course of the colon.

§ 3. **Diarrhœa.**—Diarrhœa is more common and of much greater moment than constipation. It is generally due to intestinal catarrh, and sometimes combined with vomiting, whether the stomach itself is inflamed or not. The fæces become watery, greenish, often offensive, and mixed with much gas. Even if they are yellowish, the diapers by exposure to the air become greenish. The acrid dejections chafe the buttocks and thighs. The child cries much, becomes weak, loses flesh, and becomes somnolent. In bad cases the large fontanelle sinks deep in between the bones. Many children lose their lives from this complaint.

The disease is particularly common among bottle-fed children. Often it is due to sour milk. In nursing children I have often found the cause to be the use of beer by the mother or nurse. I inferred this from the uselessness of the usual remedies and from the recovery promptly following the abstinence from beer in the nurse. Instead of digestion a fermentation takes place in the stomach or intestine, or both, which is due to microbes. These abound normally in the intestinal tract a few hours after the birth of the child. They are brought in by milk, even breast-milk, or swallowed with the air or inserted through the rectum. In the last way the disease may even become contagious.

Too frequent feeding may also cause diarrhœa. The digestive organs do not have time to dispose of the food ingested before a new supply arrives. The milk may also be too rich in fat or in salts.

Treatment.—A chief point is to let the organs have rest. The child should, therefore, be fed with as long intervals as possible. It is much better for it to go hungry for six hours than to have its stomach irritated by food it cannot digest. Thirst should be relieved by giving the child boiled water, to which whiskey may be added with advantage, or a weak infusion of chamomile flowers or fennel-seed. If the case is at all serious and does not yield to medicinal treatment, I suspend nursing altogether and substitute Nestle's food, which seems to have a most happy drying effect on the bowels. The mother should milk out her breast several times a day, to keep up the secretion. If the child is fed with "modified milk," it should be ordered with a low percentage of fat and salts.

The remedy that has given me the best results is nitrate of silver:

℞ Argenti nitratis, gr. i (6 centigrammes) ;
Aquæ destillatæ, ℥iv (120 grammes).—M.
Dispense in a dark bottle.
Sig.—A teaspoonful every hour or two.

This is particularly valuable if, besides the diarrhœa, there is vomiting. When the vomiting stops and the diarrhœa continues, it is best to give calomel (gr. ⅙—1 centigramme—three or four times a day). Bismuth subnitrate, salicylate, or subgallate (gr. 1–2—from 6 to 12 centigrammes) at similar intervals is also good. It may be given in chalk mixture, which is an antacid. For the latter purpose calcium carbonate or phosphate (gr. 1–2—from 6 to 12 centigrammes—every hour or every two hours) may also be used. Besides the antifermentatives already named, resorcin or salol (gr. ¼–½—from 15 to 30 milligrammes) may answer a good purpose. Small doses of opium both relieve pain and moderate the peristaltic movement (pulv. Doveri gr. $\frac{1}{10}$–⅓—from 6 to 20 milligrammes—every two hours).

At the beginning of the treatment it may be well to remove irritant substances from the intestinal tract by the stomach-pump, high enemas with soapsuds, or half a teaspoonful of castor oil.

If the skin is hot, the abdomen should be covered with cloths wrung out of cold water, which are changed as often as they get warm, during two or three hours. But when the child becomes chilled all over the cold applications should be discontinued.

As stimulants may be given alcohol, camphor (gr. ¼–½—from 15 to 30 milligrammes), or Siberian musk (gr. i—6 centigrammes—every half-hour until gr. v–x—from 30 to 60 centigrammes—have been used).

High enemas with hot water (100° F.), a little alcohol, a drop of laudanum, and boiled starch are stimulating, tranquillizing, and drying. They may be repeated three times a day.

§ 4. **Icterus.**—In the description of the changes that take place in the new-born child (p. 598) we have mentioned icterus neonatorum as being so frequent an occurrence that it cannot be looked upon as a disease. But besides this benign form there is a malignant form, which constitutes a serious, often incurable, ailment. The biliary ducts may be closed or the child may have congenital cirrhosis of the liver, fatty degeneration, or epidemic hæmoglobinuria, all of which are incurable. Duodenal catarrh may temporarily block up the common bile-duct, when the prognosis is better. Icterus appearing in general sepsis is ominous. Often the jaundice is a symptom of congenital syphilis.

Duodenal catarrh calls for aperient medicine, especially rheum or calomel. If the disease is of syphilitic origin, the prognosis is grave, but a thorough specific treatment may sometimes effect a cure.

CHAPTER VIII.

TETANUS.

Tetanus neonatorum is found as a common disease among the natives of East India and on certain European islands—St. Kilda, one of the Hebrides, and Westmannsoe, near Iceland. Sometimes so-called epidemics have also occurred in the practice of one midwife.

True tetanus can only be produced by the specific *bacillus tetani*, which enters through the umbilical wound. But perhaps a similar kind of spasms may be brought on by an overheated bath or exposure to cold or lesions of the brain and the medulla.

The disease begins between the third and the tenth day after the birth of the child. First some spasms are noticed about the mouth. The child cannot suck or soon lets go the nipple. Next, the mouth cannot be opened, the tetanic contraction of the masseter muscles causing *lockjaw*, or *trismus*. Within twelve hours the muscles of the neck are seized, producing opisthotonus, and thereafter the whole body may be drawn into the process and clonic may alternate with the tonic convulsions. The temperature may rise enormously (106–111° F.).

As a rule, the disease ends fatally within twenty-four hours, but if it takes a slower course the prognosis is better; and if the child survives five or six days, there is fair hope of its recovery.

Treatment.—As a precaution it is wise to leave a place where the disease is endemic and be confined at a distance.

If tetanus antitoxin can be obtained, about $\frac{1}{15}$ of the dose for an adult should be injected subcutaneously, and repeated if it improves the condition of the child. At the same time narcotic and antispasmodic remedies should be used. Medicine must be given hypodermically. Tincture of opium, ♏i (6 centigrammes); sulphate of atropine, gr. $\frac{1}{1000}$–$\frac{1}{600}$ (from 0.06 to 0.1 milligramme); curare, gr. $\frac{1}{50}$–$\frac{1}{30}$ (from 1 to 2 milligrammes); extractum fabæ calabar, gr. $\frac{1}{30}$–$\frac{1}{2}$ (from 2 to 30 milligrammes), have all effected cures. Chloral hydrate may be given by the rectum (gr. i–v—from 6 to 30 centigrammes—from six to ten times daily). Chloroform inhalations may be used from time to time.

Since the convulsions get worse by handling the little patient, baths are not practicable. High temperature may be combated with cold applications, antifebrin, or antipyrin.

The wound should be cauterized with Paquelin's thermocautery, painted with tincture of iodine, and dressed with a solution of carbolic acid (1 per cent.).

Food should be given through the nose with a medicine-dropper or a teaspoon.

CHAPTER IX.

DISEASES OF THE AIR-PASSAGES.

§ 1. **Acute Nasal Catarrh.**—Catarrh of the upper air-passages is quite common. Acute nasal catarrh, popularly known as *snuffles*, is due to a cold, draughty room, or a dry and dusty atmosphere. Like everything else which interferes with nursing, it acquires in the infant an importance which it has not in the adult. The passages through the nose are very narrow and easily blocked up, but a free circulation of air through the nose is necessary to the act of sucking. The ailment may, therefore, claim the attention of the physician.

The crib should in the cold season be placed away from doors and windows. A screen may also be needed to protect the child against draughts when a door is opened. At the same time the room should be kept properly ventilated and at an even temperature of about 70° F. It may be well to cover the infant's head with a cap. If the nose becomes obstructed, it may be cleaned with a camel's-hair brush or an applicator wound with absorbent cotton. This may be dry or moistened with a saturated solution of boric acid or some astringent fluid, containing alum, sulphate of zinc, bismuth, or—best of all—cocaine hydrochlorate (1 per cent.). If the latter is used, the general effect should, however, be watched, and the process should not be repeated oftener than every three hours. In mild cases it suffices to let the child inspire the vapor of warm water held in a cup in front of the nose or evaporating from a kettle kept boiling near the crib.

Catarrhal fever may be combated with sodium salicylate, quinine, antipyrin, phenacetin, or aconite, and a dose of Dover's powder towards night.

§ 2. **Catarrhal Laryngitis.**—Catarrhal laryingitis is attended with fever, a hoarse cry, and a barking cough.

Inhalations of warm vapor, warm applications or salted bacon tied around the neck, and a syrup containing opium or heroin are indicated.

§ 3. **Atelectasis.**—Atelectasis may be congenital or acquired.

The respiration is shallow and accelerated. Air may not enter in one side of the chest. If the affection implicates a large part of the lungs, percussion-sound is dull.

The condition is dangerous. It is of paramount importance to make the child cry. In the congenital form all the remedies recommended above (p. 559) for asphyxia may be used. In the acquired form it is practical to close the mouth and nose from four to eight seconds, which causes an accumulation of carbonic acid in the blood and produces deep inspiration. When the acute stage is passed, the child should be carried about, and when it lies down it should alternately lie on the two sides, not on the back.

Alcohol and camphor should be used freely. High enemas with hot water, to which alcohol may be added, have not only a stimulating effect in virtue of the heat and the mechanical irritation, but much water is absorbed and goes to fill the blood-vessels in the lungs.

CHAPTER X.

CONGENITAL DISEASES OF THE HEART AND LARGE BLOOD-VESSELS.

DISORDERS in the circulation may be due to a faulty development or intra-uterine inflammation. The foramen ovale between the atria may remain open or the partition between the ventricles may be defective, the ductus arteriosus or the pulmonary arteries may be too narrow, or the heart too small. *Endocarditis* during fetal development affects most often the right side of the heart. As in later life, it distorts the valves, causing stenosis and insufficiency.

Hæmatoma of the free margin of the mitral valve is formed under the endocardium immediately or soon after birth. It gives rise to a systolic murmur, but is likely to disappear.

Children suffering from congenital disease of the heart and the large vessels require extraordinary care. If nothing else can be done for them, they must at least be protected against cold, which they stand badly. Most of these children, fortunately, die soon. If they do not, digitalis, iodide of potassium, strychnine, and nitroglycerin may, perhaps, help them to carry their burden.

CHAPTER XI.

CYANOSIS.

THE blue color in a baby is apt to inspire dread among the lay bystanders at its birth. The intelligent physician, however, is not disturbed by this sight. In fact, he may hail it as a reassuring sign. In a case of asphyxia there is no comparison between the danger in which a sturdy violet baby is and that of a limp white one. Also in atelectasis there may be a fair chance of obtaining good respiration, and the same applies if the "blue baby" is born prematurely and only suffers from weakness. But if the blue color persists, it is certainly a sign of some serious condition of the circulatory or respiratory organs, such as the just-mentioned faulty development of the heart and large blood-vessels or valvular disease. The blue color may also be due to pneumonia, pleurisy, malformations of the air-passages, or pressure on the trachea or the respiratory nerves—for instance, by an enlarged thymus gland.

The *treatment* varies with the nature of the case and has partly been described on preceding pages. Further information about it must be sought in treatises on diseases of children.

CHAPTER XII.

HEREDITARY SYPHILIS.

SYPHILIS has a most deleterious effect on the offspring. Frequently it leads to abortion (p. 341), which commonly occurs either in the seventh or in the third month. Nearly one-half of all syphilitic children are still-born, and of those born alive seventy-five per cent. die within a year and most of them within a few days or weeks.

Syphilis may be inherited either from the father or from the mother, but if it comes from the father he generally infects his wife. Sometimes the disease may remain latent in her, but when the eruption comes it has the character of a late affection, appearing as grouped papules or deep ulcers and not as a macular eruption spread all over the body, as in the first outbreak of secondary syphilis.

A woman with secondary syphilis nearly always gives birth to syphilitic children, even if she was healthy at the time of conception and has been infected during her pregnancy. If syphilis is latent in her, she may alternately bear syphilitic or healthy children, which probably finds its explanation in Virchow's metastasis theory, according to which the blood is not always contaminated, the poison being retained in the solid parts of the body, especially the lymphatic glands, and only at times set in circulation. Syphilis produces a circumscribed endometritis, which may explain why women may continue for years to have abortions or give birth to syphilitic children.

But in course of time the syphilitic taint loses its strength, and thus women with tertiary symptoms in the skin, the mucous membranes, and the bones may bear healthy children, who remain healthy. And so also in regard to the father. If a man with recent syphilis marries, as a rule, he infects his wife and begets syphilitic children, but if a period of say two years has passed since he last had any symptoms of syphilis, he rarely infects his wife, and they may have healthy children.

How variable the laws for hereditary syphilis are, is illustrated by the fact that of twins one may be infected and undergo the usual changes, while the other escapes.

Hereditary syphilis may be congenital, that is the child may be born with symptoms of syphilis, but much more frequently the disease appears between the first and the twelfth week after birth. It appears most often during the first month and becomes rarer in the second and still more so in the third.

Symptoms.—The child may be born in apparently good health, but soon nutrition is impaired. The child loses in weight. Its skin becomes too wide for it and lies in wrinkles and folds. Its voice becomes weak and whimpering. On account of fissures at the angle of the mouth, it cannot suck.

As a rule, syphilitic children are small and light. They may also be born with *pemphigus*, that is apt to have an exfoliating character. On all parts of the body except the scalp, and especially frequently on the palms of the hands and the soles of the feet, there may be an eruption of tense vesicles, ranging in size from a pea to a hazel-nut. Often these vesicles have become confluent, so as to form large, irregular surfaces, covered with blood or pus, in the contour of which hang shreds of epidermis. On other places the skin is dry, ash-colored, and covered with seborrhœal crusts. The last phalanges of the fingers are apt to suppurate, and the nails may fall off. Such children generally die within a week; but if the disease takes other forms and appears later, the course is less rapid, and with proper treatment there is even a fair chance of curing them and raising them.

Coryza, or *snuffles*, is one of the earliest symptoms. The air-passages through the nose become blocked up, and there is a purulent discharge from the nostrils. The conjunctiva may be inflamed.

There may come an eruption of pemphigus, as described above. Or there may be red, elevated *papules*, of the size of lentils, generally appearing in groups and limited to certain localities, especially the face, the arms, the genitals, the palms of the hands, and the soles of the feet. But there is never a general eruption of macular syphilides as in fresh secondary syphilis.

Fissures, or *rhagades*, form in the lips, around the anus, or between the fingers.

The mucous membrane near the skin is also affected. On the inside of the lips and cheeks, on the palate, and on the tongue there may be excoriations or superficial ulcers, but not well-developed mucous patches.

The voice may be harsh and deglutition difficult, so that the milk is not swallowed, but ejected through the nose.

The folds at the anus are swollen and often fissured, which causes painful defecation. The *ear* is not rarely the seat of a deep inflammation, and even gangrene, which gives rise to an offensive discharge.

The internal organs are no less affected. An abscess may form in the thymus body. The lungs may offer an aspect that has been called *white hepatization*, or contain gummata. The liver and spleen are often enormously enlarged. In the liver the inflammation often follows the branches of the vena porta—pylephlebitis. The long bones are affected in a very peculiar way, which even is seen in the macerated fœtus. Between the diaphyses and epiphyses of the long bones there is a broad zone of ossification with very irregular prolongations. Among the bony tissue are islands of cartilage, and in the cartilage are found ossified nuggets.

In very rare cases the child may be infected during labor by being pressed against mucous patches on the maternal genitals. But then the disease will appear later and have the character of acquired and not of hereditary syphilis. In the former we have a general macular eruption, mucous patches, and swollen lymphatic glands, while in the latter there is a vesicular or papular eruption, rhagades, etc., but not mucous patches or adenitis.

Prognosis.—With the exception of the syphilitic pemphigus, the prognosis in hereditary syphilis is not bad. Under proper treatment recovery usually ensues in from four to eight weeks, and some of the children remain well. In others there may be a slight relapse, which yields easily to specific treatment. But others are less fortunate. They may become the prey of furunculosis, pneumonia, or diarrhœa, which exhausts their strength and puts an end to their lives. A few may develop tertiary forms, such as gummous tumors in the skin or periostitis.

If the child is born alive, the question arises, How shall it be fed? The general teaching is that the syphilitic child cannot do its mother any harm, whether she shows signs of the disease or not, and the usually puny child should have the advantage of being nursed by its mother. Even if she appears healthy, she will have latent syphilis and, therefore, be immune. It is true, there are cases on record in which the children after their birth communicated syphilis to their apparently healthy mothers who nursed them, but this is so exceedingly rare that it practically may be left out of consideration.

To use a wet-nurse would be criminal and might lead to a suit for damages, since she would be sure to get the disease from the nursling. If the mother refuses to take the risk, which in her case is very small, the child must be brought up on artificial food.

Treatment.—Calomel (gr. $\frac{1}{12}$ to $\frac{1}{6}$—from 5 to 10 milligrammes) two or three times a day is well borne. If the child has diarrhœa, pulvis Doveri (gr. $\frac{1}{20}$–$\frac{1}{12}$—from 3 to 5 milligrammes) may be added to each dose. It is better to avoid inunction with blue ointment, since the fine skin of the baby stands it less well, and there often are excoriated surfaces. If necessary, it is used in 10-grain doses—60 centigrammes—once daily. Corrosive sublimate has been administered in an entire bath (gr. xv to 5 gallons of water), but it is better to avoid it, the same objections applying to mercurial baths as to inunction. Exceptionally, it may be given hypodermically (gr. $\frac{1}{60}$–$\frac{1}{30}$—from 1 to 2 milligrammes) once or even twice a day dissolved in water (240 parts).

Excoriations are soothed and their healing favored by the daily administration of a warm bath with bran or starch.

Fissures may be smeared with the boiled lead ointment, of which I have given the formula above (p. 764), or iodoform ointment (1 : 4). Or they may be painted with a solution of ferri et potassæ tartratis (1 : 20), or once a day with a solution of nitrate of silver (1 : 50).

CHAPTER XIII.

HEMORRHAGE.

WE HAVE already mentioned bleeding from the umbilical cord (p. 801), but other localities may also be the source of hemorrhage.

§ 1. **Hemorrhage from the Vagina.**—A bloody discharge from the vagina is not very rare in new-born girls. It is without importance and gets well without treatment. It seems that the great functions preparing in the uterus and the breasts of the mother towards the end of pregnancy have their analogon in the child, producing a congestion to the corresponding organs. Hence the mastitis that is so common in new-born children, male as well as female, and the bloody discharge from the female genitals, due to a condition of the uterine mucosa like that of menstruation.

If the physician finds it necessary to do something, he may order vaginal injections of a few ounces of diluted lukewarm liquor ferri chloridi (♏viii to ℥iv—50 centigrammes to 120 grammes), but it is better to leave the discharge to the *vis medicatrix naturæ.*

§ 2. **Hemorrhage from the Intestinal Tract.**—Bleeding from the rectum is a much more serious matter. It is a symptom of the disease called *melæna.* Large quantities of dark fluid blood may be evacuated from the anus, and blood may also be vomited. Sometimes there are ulcers on the mucous membrane of the stomach and the duodenum; but in other cases there are no ulcers and no ruptured blood-vessels to be seen, and still there is not only found blood in the intestinal canal, but also in the peritoneal cavity.

The true nature of the disease is unknown. Some think it is due to minute emboli coming from the umbilical vein. Others take it to be caused by an invasion of fungi. Others again attribute it to compression of the head during labor. In this connection I may mention that I have seen extravasation of blood in the suprarenal capsules after a difficult forceps delivery.

The pulse soon becomes insensible, the skin is cold, and the child will not nurse. The disease is generally fatal, and death occurs in two or three days.

From a diagnostic stand-point it should be remembered that if a child vomits blood, it may be maternal blood, sucked from a sore nipple; but then the quantity is of course small, and the child would not get seriously ill. If blood from this source went through the intestine, it would become thick and tarry when evacuated from the bowel.

Treatment.—A case has been reported which was successfully treated with extract of suprarenal capsule. Twelve grains were administered in twenty-four hours. The dry powder is put into the mouth, and no water must be given with it.

The strong hæmostatic effect of this drug taken internally or applied locally in all kinds of hemorrhage, is a great inducement to use it in a disease in which therapeutics thus far has accomplished so little. Otherwise, the tincture of chloride of iron, ♏i–ii (from 6 to 12 centigrammes) every one or two hours, hydrastinine in a 5 per cent. solution, 5 drops subcutaneously, or ergotine may be tried, and under all circumstances the child must be kept warm to counterbalance the internal loss of heat.

§ 3. **Hemorrhage from the Kidneys; Acute Hæmoglobinuria; Winckel's Disease.**—Small but very fatal endemics have arisen in lying-in hospitals of a disease in which the urine becomes loaded with hæmoglobin. Of 29 children thus affected 24 died. At first the skin becomes cyanotic, and later icteric. The urine has a brownish color. The fæces become dark brown. The children refuse to nurse, and nearly all die in the course of a few days.

At the autopsy were found hemorrhagic infarct of the lungs, fatty degeneration of the liver, interstitial nephritis, and a swollen spleen.

The disease has been attributed to infection with bacterium coli commune found in the well water with which the mouths of the children were washed, but it is doubtful if that is the real cause.

§ 4. **Acute Fatty Degeneration; Buhl's Disease.**—This affection has some important points in common with the preceding. In fact, it is perhaps the same disease, and some think that both are streptococcus infection.

Most of the children were born asphyctic. They showed great tendency to bleeding from the navel, which resisted all treatment. There were extravasations of blood under the skin, and blood was evacuated by the anus and vomited. Sometimes there was also nosebleed. Within from three to six days the skin became icteric. Most of the children died within two weeks.

The autopsy showed bloody extravasation in the pleura, pericardium, and meninges, the skin and mucous membranes, the muscles, and the thymus body. Secondly, there was found acute fatty degeneration of the liver, the myocardium, the intestinal villi, and the epithelium of the convoluted tubules of the kidneys.

The disease is said to be found also in the sheep and the hog, and there to be hereditary, especially in certain varieties.

§ 5. **Pulmonary Apoplexy.**—In rare cases, when a child cries or coughs much, a blood-vessel may rupture in its lungs. There is then a bloody discharge from the mouth, which soils the clothes and frightens the friends, but in reality is not serious. I would recommend the extract of suprarenal capsule.

CHAPTER XIV.

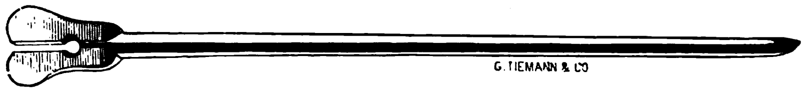
DEFORMITIES.

§ 1. **Harelip.**—If the child can nurse, it is better to defer the operation for a few months; but if the deformity prevents the child from taking the breast, it is better to perform the operation at once. By placing silver sutures before cutting, the loss of blood is so small that it does in no way weaken the child.

§ 2. **Cleft Palate.**—This condition prevents the infant from forming that vacuum in its mouth which is necessary for drawing the milk from the breast, and the operation for it is so tedious, painful, and bloody that it is not advisable to subject a new-born child to it. Some dental surgeons have been very successful in adapting to the cleft an obturator that supplements the deficient partition between mouth and nose. Perhaps also a rubber flap attached over the nipple of the bottle may enable the child to suck.

§ 3. **Tongue-tie, or Ankyloglossum.**—If the frænum of the tongue is too short or prolonged too far forward it interferes with the free mobility of that organ, and may thus constitute an impediment to nursing, which easily can be removed by a little operation. A bifid director (Fig. 503) is passed so as to lift the tongue and embrace the frænum, which then is cut with a pair of blunt, curved scissors under the director. A little pressure with sterile gauze will soon arrest the bleeding.

FIG. 503.



Director for tongue-tie.

§ 4. **Encephalocele, or Hernia Cerebri; Meningocele.**—A part of the brain, covered with its meninges, may protrude from the cranium so as to form a tumor under the skin. This is called *encephalocele*, or *hernia cerebri*. It is always found in a fontanelle or suture, most commonly the small fontanelle, or between forehead and nose.

That in front may have the size of a hen's egg, while that behind may be as large as the whole head.

The tumor is globular, symmetrical, often pedunculated, covered with normal skin, pulsating, and increases by crying and other forced expiration. It is opaque unless it is complicated with hydrocephalus. It can be more or less replaced. It is a rather rare deformity. I have seen only one of each of the two varieties mentioned.

Diagnosis.—Formerly it was confounded with *cephalœmatoma*, but this is situated on a bone and cannot be replaced.

The *prognosis* is doubtful, the worse the larger the tumor is. The combination with hydrocephalus makes it also more unfavorable.

Treatment.—The tumor should be protected against injury, with which, when it is small, slight compression may be combined. Operations are usually fatal, but most parents will prefer this issue to having a deformed child.

The base may be surrounded by an elastic ligature; or the tumor may be cut off and the edges united by suture. If it is combined with hydrocephalus, it may be punctured.

If the dura mater alone forms the pouch, and no brain matter is prolapsed, the condition is called *meningocele*. The prognosis is better and the treatment the same as for encephalocele.

§ 5. **Spina Bifida, or Hydrorrhachis.**—There is some analogy between encephalocele and meningocele on one side and spina bifida on the other. While the former consists in an imperfect closure of the cranium and protrusion of the brain or its meninges through the opening, in spina bifida there is a congenital absence of one or more vertebral arches, and through the gap protrude the spinal meninges, forming a bag filled with cerebrospinal fluid (Fig. 318, p. 402). This deformity is much more common than the preceding one.

As a rule, there is only one such hernia, and that in the lumbar region; but exceptionally two or three have been found in other portions of the spine of the same individual.

A globular or circular soft tumor is found in the median line of the back. If the opening through which it connects with the spinal canal is small, it may be pedunculated, but if the opening is large the tumor is sessile. It may be covered with skin, but more often this is absent, and the posterior wall is formed only by the dura mater. In the circumference is felt a bony ring, formed by the edges of the vertebral canal. The swelling increases during the child's crying, and can be more or less reduced by pressure; but the latter is not without danger, since it may produce paralysis or convulsions.

Not infrequently the defect in the spine is combined with hydrocephalus or club-foot or both. Often the whole cord or the corda equina is deflected into the tumor, or spinal nerves may take their course in its wall.

In the milder degrees there are no symptoms beyond the appearance and characters of the tumor, but in the severe cases there may be paraplegia and paralysis of the musculature of the bladder and the rectum. A sudden rupture of the bag is accompanied by outflow of cerebrospinal fluid, convulsions, and generally death.

The *diagnosis* is not difficult, when we pay attention to the site, the compressibility, the increase in size during crying, and the bony ring in the circumference. By these features spina bifida is distinguishable from *cysts* and *solid tumors.*

The *prognosis* is, upon the whole, unfavorable. Most of these children die; but if the tumor is small, and especially if it is covered with skin, they may live and grow up. The communication with the spinal canal may close, and the remainder of the tumor, having become isolated, can easily be removed without danger.

Treatment.—The tumor should be covered with a soft pad, and be protected against pressure. The most successful treatment consists in injection of iodine. A single drop of the tincture injected into the sac has led to agglutinative inflammation and a cure. But the method that has given the best results consists in letting out about one-half of the fluid with a fine aspirator needle and injecting from ʒss to ʒii (from 2 to 8 grammes) of this fluid:

℞ Iodi, gr. x (60 centigrammes) ;
Potassii iodidi, ʒss (2 grammes) ;
Glycerini, q. s. ad ℥i (30 grammes).—M.

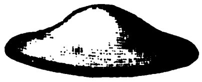
In making the puncture the median line should be avoided, on account of the possible presence there of the cord. During the operation the child's head should be held low, and no pressure should be exercised on the tumor. The opening is closed with a piece of court-plaster and collodium. After closure of the wound slight compression is used to prevent too rapid refilling of the pouch. If successful, the operation may be repeated in a few weeks.

The frequent presence of parts of the nervous system in the sac excludes the use of the ligature, and cutting operations have nearly always proved fatal. The severe form is incurable.

§ 6. **Umbilical Hernia.**—The umbilicus is the last point closed in the formation of the body, and especially the abdominal cavity. This closure may be more or less imperfect, and then the result is an umbilical hernia. In the minor degree the intestine drives the umbilical cone forward as a little skin-covered tumor of the shape and sometimes of the size of the last phalanx of the thumb of an adult. This is easily reduced by pressure with a little button about an inch in diameter, convex and smooth on one side and flat and rough on the other (Fig. 504), which button is applied with its convexity towards the umbilicus and kept in place with a piece of rubber adhesive plaster. When this gets loose it is renewed, and this truss is used until the child has outgrown its hernia, which may take several months.

In the higher degree of umbilical hernia there is a defect in the abdominal wall. The skin and other parts comprising the abdominal wall are lacking on a certain area around the place where the umbilicus should have been formed. Through this gap the intestinal knuckles and perhaps part of the liver protrude, only covered with amnion. If the defect is no larger than to allow one to bring the edges together, these ought to be pared at once and united by sutures as after laparotomy. Since the child may be expected to cry much and to become dirty, it is preferable to use silver wire for the stitches, which do not absorb fluid, act as splints, and even have antiseptic properties.

FIG. 504.



Navel button.

§ 7. **Atresia Ani.**—We have stated above (p. 246) that if a child does not pass any meconium during the first twenty-four hours of its life its failure to do so is often due only to an agglutination of the epithelium in the anal canal, and all that is needed to produce a copious movement of the bowels is to introduce the well-greased little finger into the rectum. But it is quite another thing if there is no anus and perhaps no rectum either. If there is only a more or less thin septum between the rectum and the anus,—or the skin, when there is no anus,—it should be split with a crucial incision and the intestine sutured to the anus or skin.

The intestine may end as a blind sac more or less far up in the pelvis, or it may open into one of the hollow organs of the pelvic cavity,—the uterus, the vagina, the bladder, or the urethra. The pelvis of the new-born child measures only from one to one and a half inches in diameter, and it is exceedingly difficult to perform any operation in so narrow a space. The mechanical difficulties created by the lack of room are enhanced by the obscurity in which the precise diagnosis often is shrouded. The operator gropes in the dark, afraid of causing perhaps irreparable lesions.

If the bowel cannot be reached from below, the propriety of *colostomy* or *enterostomy* may be entertained. If determined upon, right lumbar colostomy is indicated on account of the possibility of the absence or malposition of the descending colon. For the details of these operations the reader is referred to treatises on operative surgery. The prognosis is very doubtful.

CHAPTER XV.

SUDDEN DEATH OF THE BABY.

If the child lies in the mother's bed, she may unwittingly roll over it and smother it. That the same can be done with criminal intent need hardly be added.

Death without disease may be due to apoplexy, a cerebral vessel bursting under the blood-pressure caused by violent and prolonged crying. A sudden congestion of the thymus gland may compress the trachea and thus give rise to asphyxia. There may be defects in the internal organs, for instance, imperforate ureters, or some other condition incompatible with life.

INDEX

Abdomen, pendulous, 420.
Abdominal pressure, faulty, 361.
    tumors obstructing genital canal, 433.
Abortion, 262.
    artificial, 269.
    complete, 264.
    criminal, 270.
    habitual, 268.
    incomplete, 264.
    missed, 276.
    tubal, 308.
Abscess, placental, 354.
Acardiacus, 259.
Acetabulum, 133.
Adenitis, 735.
Ædœitis, 702, 707, 729.
Ædœocolpitis, gonorrhœal, in child, 806.
After-birth, 198.
    expulsion of, 176.
After-coming head, delivery of, 384.
        occipitoposterior position, 380.
After-pain, 197, 231.
Agalactia, 758.
Air, entrance into vein, 786.
Alcohol, 580.
Alimentary canal, disturbances, 717.
Allantois, 37, 40.
Amenorrhœa, 17.
Amnion, 40.
    false, 40.
    true, 40.
Amputation, intra-uterine, 347.
    supravaginal, 670.
    utero-ovarian, 670.
Anæmia, 788.
    progressive pernicious, 336.
Anæsthesia, 203, 592, 616, 629.
Anatomy of the parturient canal, 130.
Anencephalus, 403.
Anteflexion, 297.
Anteversion, 297.
Anthrax, 339.
Antiphlogistine, 742.
Antisepsis, 186, 594.
    in labor, 725.
Aphthæ, Bednar's, 807.
Arch, pubic, 141.
Area opaca, 36.
    pellucida, 36.
Areola, adenitis, 765.
    cellulitis, 765.
    eczema, 337, 765.
    secondary, 93.
    umbilical, 95.
Arm, dorsal displacement, 383, 397.
    liberation, 382.
Arteritis, umbilical, 802.
Arthritis, 718, 744.
Articulation, iliosacral, 135.
    separation of, 546.
Asepsis, 594.
Asphyxia, 555.
Aspirator, exploratory vaginal, 736.
Assistants, 181.
Atelectasis, 559.
Atmokausis, 267, 734.
Atresia, hymenalis, 427.
Attitude, 75.
Auscultation, 111.
Autoinfection, 700.
Avulsion of head of fœtus, 563.
Axis-traction, 601.
Ayer, symphyseotomy, 649.

Bacteriology of the vagina, 125.
Ballottement, 104, 110.
Bands, amniotic, 346.
Barnes, cervical dilators, 573, 587.
Basilysis, 682.
Basilyst, 683.
Basiotribe, 682.
Bath, cold, 741.
    for baby, 210.
Bed, preparation, 186.
Bed-sores, 718, 744.
Bednar, aphthæ, 827.

Binder, abdominal, 200.
Bladder, 434.
  irritability, 334.
Blastoderm, 36.
Blastomere, 24.
Blastos, 36.
Body, polar, 24.
Bonnaire, dilatation of cervix, 586.
Brachiotomy, 687.
Braun, fillet-carrier, 634.
  key-hook, 685.
Breast, 232.
  chronic abscess, 773.
  cold abscess, 773.
  diseases of, 758.
  erysipelas, 765.
  fistula, 774.
  hypertrophy, 775.
  lymphangeitis, 766.
Breast-bandage, 236.
Breast-pump, 236.
Breech presentation, 376.
Brow presentation, 374.
Bruit, uterine, 104.
Bullæ, 718.
Busch, version, 625.

Cæsarean section, 658.
    after death of mother, 551.
    conditions for, 658.
    for placenta prævia, 504.
    Fritsch's, 665.
    indications for, 658.
    relation to other operations, 669.
    vaginal, 295, 676.
Calculation of day of confinement, 52.
Calculus, 435.
Canal, medullary, 37.
  parturient, anatomy, 130.
    the soft parts, 147.
  pelvic, 141.
Caput succedaneum, 178.
Carbolic acid poisoning, 579.
Carbolism, 579.
Carcinoma of uterus, 293.
Carunculæ myrtiformes, 121.
Catamenia, 13.
Catheterization, 203, 726.
Cavity, cotyloid, 133.
  pelvic, 141.
Cells, decidual, 27.
Cellulitis of the limbs, 718.
Cellulitis of pelvis, 709.
Cephalæmatoma, 553.
Cephalotribe, 681.
Cephalotripsy, 681.
Chloasma uterinum, 94.
Chloroform-mask, 183.
Chorea, 323.
Chorion, cellular hypertrophy of, 352
  cystic degeneration of the villi, 349
  villi of, 31.
Cervical canal, closure of, 424.
Cervix, 155.
  artificial dilatation during labor 583.
      during pregnancy, 566.
  dilatation, 167.
  hæmatoma, 523.
  incisions, 588.
  laceration, 534.
  obliteration, 167.
  œdema, 301.
  old lacerations, 425.
  rigidity, 425.
  softening, 103.
  stenosis, 425.
  thrombus, 523.
Champetier de Ribes, cervical dilator 575, 587.
Chicken-breast, 451.
Child, acute fatty degeneration, 825.
  ankyloglossum, 826.
  atelectasis, 819.
  atresia ani, 829.
  Buhl's disease, 825.
  care of new-born, 208, 246.
  catarrhal laryngitis, 819.
  cleft palate, 826.
  colic, 814.
  condition of, 244.
  constipation, 815.
  cyanosis, 820.
  definition of living, 558.
  deformities, 826.
  diarrhœa, 815.
  diseases of heart and blood-vessel 820.
    of the mouth, 806.
    of new-born, 801.
  dress of, 211.
  eczema, 811.
  encephalocele, 826.
  erysipelas, 812.
  erythema, 810.

Child, gonorrhœal ædœocolpitis, 806.
    infection, 803.
    stomatitis, 806.
  hæmoglobinuria, 825.
  harelip, 826.
  hemorrhage, 824.
    from intestine, 824.
    from kidney, 825.
    from vagina, 824.
  hereditary syphilis, 821.
  hernia cerebri, 826.
  hydroa, 811.
  hydrorrhachis, 827.
  hypertrophy of thymus, 810.
  ichthyosis, 813.
  icterus, 598, 817.
  mastitis, 809.
  melæna, 824.
  meningocele, 826.
  miliaria, 811.
  nasal catarrh, 818.
  pemphigus, 811.
  puerperal infection, 802.
  pulmonary apoplexy, 826.
  sclerema, 813.
  skin diseases, 810.
  spina bifida, 827.
  sudden death, 830.
  tetanus, 817.
  tongue-tie, 826.
  umbilical hernia, 827.
  Winckel's disease, 825.
  xeroderma, 813.
Childbirth after death of the mother, 550.
  chief features of, 161.
  permanent changes caused by, 243.
  without loss of blood, 524.
Cholera, 339.
Chorio-epithelioma, 752.
Chorioma, 752.
Chorion, 31.
  frondosum, 33.
  hyperplasia of villi, 352.
  læve, 33.
  primitive, 31.
  shaggy, 33.
  smooth, 33.
  true, 31.
Circulation, 46.
  first embryonic, 46.
  greater, 50.
  lesser, 50.
Circulation, placental, 48.
  pulmonary, 50.
  second embryonic, 47.
  systemic, 50.
  third, 50.
Circulatory organs, diseases of, 781.
Cleidotomy, 687.
Cocainization, medullary, 204.
Coccyx, 133.
Collargolum, 732.
Colostrum, 96, 232.
Colpeurynter, 299, 574.
Colpitis, 284, 702, 707, 729.
  emphysematous, 286.
  mycotic, 286.
Colpohypoplasia cystica, 286.
Comparison between forceps delivery and version, 636.
Condylomata acuminata, 289.
Cone, umbilical, 71.
Conglutination of the external os, 423.
Conjugate, available, 140.
  diagonal, 115, 142, 440.
  minimum, 140.
  obstetrical, 140.
  true, 139.
Constipation, 321.
Consultation, 594.
Contraction, uterine, 357.
Contraction-ring, 153.
Convulsions, 325.
  hysterical, 325.
Copulation, 18.
Cord, anomalies of the umbilical, 355, 413.
  coiling, 355.
  forked insertion, 71.
  knots, 355.
  liberation, 194.
  ligation, 195.
  marginal insertion, 70.
  prolapse, 414.
  protection, 210.
  rupture of vessels in velamentous insertion, 509.
  sound in umbilical, 101, 112.
  stenosis, 355.
  too long, 355.
  too short, 355.
  torsion, 355.
  umbilical, 42, 70.
  velamentous insertion, 70.
Corpus luteum, 11.

Corrosive sublimate poisoning, 578.
Cotyledon, 68.
Cotyloid cavity, 133.
Courses, 13.
Cranial vault, removal of, 682.
Cranioclasis, 680.
Cranioclast, Braun's, 680.
  J. Y. Simpson's, 680.
Craniopagi, 412.
Craniotomy, 677.
Craniotomy-forceps, 682.
Credé, B., collargolum, 732.
    unguentum, 732.
  Carl F. S., disinfection of eyes, 209.
    expression of placenta, 197.
Creolin, 579.
Cross birth, 391.
Crotchet, 684.
Curettage, 569.
Curette, Récamier's, 569.
  Simon's, 569.
  Sims's, 569.
  Thomas's, 569.
Cushion, inflatable rubber, 182.
Cyst, ovarian, 295.
Cystitis, 777.
Cystocele, 435.

Death of mother during pregnancy, 345.
Decapitation, 685.
Decidua, atrophy, 352.
  basilaris, 30.
  capsularis, 30.
  cystic, 352.
  diseases of, 352.
  hyperplasia, 352.
  hypertrophy, 352.
  menstrual, 14.
  of pregnancy, 27.
  placentalis subchorialis, 35.
  reflexa, 29.
  serotina, 29.
  vera, 30.
Deciduoma malignum, 752.
Decubitus acutus, 654.
Degeneration, lipoid, 309.
Delivery-room, 219.
Denidation, 17.
Depressions, 461.
Depressor, Garrigues's, 119.
  Hunter's, 118.
Desmarre, retractor, 805.
Diagnosis between first and later pregnancies, 121.
Diameter of Beaudelocque, 117.
Diaphragm, pelvic, 151.
Diarrhœa, 321.
Dicephalus, 408, 412.
Dilator, Arthur Müller's, 588.
  Barnes's, 573.
  Champetier de Ribes's, 575.
  Garrigues's, 567.
  Goelet's, 567.
  Hanks's, 566.
Discus proligerus, 6.
Disinfection, 188, 190.
  in lying-in hospitals, 218.
  of doctors and nurses, 724.
  of instruments, 725.
  of materials, 724.
  of patients, 724.
  of wards, 723.
Disk, germinative, 36.
Displacements of uterus, 297, 755.
Distance, sacrocotyloid, 139.
Double manœuvre, Siegemundin's, 635.
Douche, preliminary, 202.
Douche-pan, 181.
D'Outrepont, version, 625.
Drainage-tube, double, 736.
  skyrocket, 736.
Duct, Müllerian, 276.
  Wolffian, 276.
Ductus arteriosus, 48.
  venosus, 48.
Dührssen, deep cervical incisions, 588.
  vaginal Cæsarean section, 676.
Dyspnœa, 321.

Ear presentation, 366.
Eclampsia, 325, 525, 795.
Ectoderm, 26, 31, 36.
Ectomere, 26.
Eczema of areola, 337.
Elephantiasis congenita cystica, 401.
Elytritis, 284.
Embolism of artery, 781.
  of pulmonary artery, 784.
  of venous system, 782.
Embryo, 37.
Embryotomy, 677.
Eminence, ileopectineal, 135.
Encephalitis, 744.
Encephalocele, 401.

Endocarditis, 344, 716, 743.
Endochorion, 31.
Endomere, 26.
Endometritis, 702, 708, 730.
  cystic, 283.
  decidual, 282.
  hemorrhagic, 283, 352.
  tuberosa and polyposa, 283.
Enema before labor, 187.
Enteritis, 743.
Entoderm, 26, 36.
Enucleation of the head, 193.
Enuresis, 334.
Epiblast, 36.
Epignathus, 401.
Epilepsy, 325.
Epiphysis, loosening of, 462.
Episiotomy, 428, 541.
Epithelial pearls, 808.
Ergot, 725.
Erysepelas, 340, 799.
  of breast, 765.
Erythema, 718.
Evisceration, 686.
Evolution, spontaneous, 394.
Examination, bimanual, 115.
  physical, 107.
  rectal, 117.
  vaginal, 114, 188.
Excretion, 45.
Exochorion, 31.
Exophthalmus, 461.
Eyelid retractors, 805.
Eyes, disinfection of, 209.

Face presentation, 367.
Fasciæ, pelvic, 151.
  perineal, 151.
Fecundation, 21.
Feeding, artificial, 251.
Fetation, multiple, 257.
Fever, eruptive, 798.
  malarial, 800.
  of pregnancy, 335.
Fever-cot, 740.
Fibroid of abdominal wall, 758.
Fillet, 629.
  in groin, 388.
  mode of passing over foot, 387.
  on thigh, 389.
Fillet-carrier, 388.
  Braun's, 634.
  Routh's, 635.
Fissure, 460.
Fistula of breast, 774.
  fecal, 780.
  urinary, 778.
Flow, monthly, 13.
Fœtus, aneurism of aorta of, 402.
  ascites of, 401.
  avulsion of head of, 563.
  carcinoma of liver of, 401.
  changes in, after death, 355.
  cystic degeneration of kidneys, 401.
  death of, 261.
  development of, in each lunar month, 54.
  distended bladder, 402.
  emphysema, 402.
  excessive size, 397.
  expression, 589.
  expulsion, 170.
  fibrocystic degeneration of testicle, 401.
  hydronephrosis, 401.
  hydrorrhachis, 402.
  hydrothorax, 402.
  in fœtu, 401.
  injury to, during labor, 552.
  life of, 593.
  lymphectasia, 402.
  macerated, 356.
  maturity, 64.
  mummified, 356.
  œdema, 402.
  papyraceus, 356.
  peritonitis, 401.
  sanguinolentus, 356.
  spina bifida, 402.
  tympanites, 402.
Fold, medullary, 37.
  of Schultze, 72.
Follicle, Graafian, 9.
  primary Graafian, 4, 7.
Fontanelle, 157.
Fonticuli Gasseri, 158.
Food, artificial, 249.
Foot presentation, 376.
Footling presentation, 376.
Foramen of Botallo, 47.
  ovale, 47.
Forceps, action of, 602.
  application of, 606.
  applied to after-coming head, 385.
    to breech, 390.
  Breus's, 600.

- Forceps, Chamberlen's, 596.
  - conditions for the use of, 605.
  - construction of, 594.
  - dangers for fœtus, 617.
    - for mother, 616.
  - delivery by, 594.
    - compared with version, 636.
  - Elliott's, 598.
  - for carrying Champetier de Ribes's dilator, 576.
    - rubber bags or gauze into the uterus, 574.
  - high, middle, and low operation, 615.
  - Hodge's, 599.
  - how it grasps head, 611.
  - indications for the use of, 604.
  - Levret's, 596.
  - Naegele's, 598.
  - A. R. Simpson's axis-traction, 595.
    - new model, 602.
  - J. Y. Simpson's, 598.
  - Tarnier's axis-traction, 600.
- Forces, expellant, 163.
- Foretelling duration of labor, 190.
- Formalin, disinfector, 723.
- Fountain syringe, 182.
- Fracture, maternal, 547.
  - of cervical vertebræ, 462.
  - of collar-bone, 462.
  - of humerus, 462.
  - of skull, 460.
- Fritsch, Cæsarean section, 665.
- Functions, fetal, 51.
- Fungus, umbilical, 801.
- Galactocele, 774.
- Galactorrhœa, 758.
- Galbiati, falcetta, 648.
  - modernized, 648.
- Gangrene of leg, 787.
  - of navel, 802.
  - of vagina, 730.
  - of vulva, 730.
- Garrigues, H. J., apparatus for transfusion and infusion, 582.
  - blunt expanding perforator, 736.
  - dilator, 567.
  - intra-uterine glass tube, 577.
    - metal tube, 571.
  - L. F., operation for salpingitis, 738.
  - occlusion-dressing, 200.
  - symphyseotomy-bandage, 653.
- Garrigues, H. J., weight speculum, 568.
- Gastro-elytrotomy, 657.
- Gelatin of Wharton, 42.
- Genital cord, 276.
  - organs, diseases of, 276.
- Gestation, ectopic, 302.
- Giant child, 397.
- Gland, mammary, during lactation, 96.
- Globule, directing, 24.
  - extrusion, 24.
- Goelet, dilator, 567.
- Goitre, exophthalmic, 344.
- Gonorrhœa, 338.
- Gonorrhœic infection, 719.
  - of child, 803.
- Goring, 262.
- Groove, medullary, 37.
  - primitive, 37.

- Hæmatoma of child's neck, 462.
  - of vulva, 292.
- Hæmophilia, 344.
- Hall, Marshall, method of reviving, 561.
- Hand, half the, 189.
- Hanks, dilator, 566.
- Harris, M. L., symphyseotomy, 649.
  - Philander, manual dilatation of cervix, 585.
- Hay, director, 649.
- Head, fetal, 156.
  - asymmetry, 178.
  - diameters, 160.
  - physiological congenital asymmetry, 460.
- Headache, 322.
- Heart disease, 343, 525.
- Heart-clot, 782, 784.
- Heart-sound, fetal, 112.
- Heating, 220.
- Hemicephalus, 403.
- Hemorrhage, 496.
  - post-partum, 509, 755.
  - secondary, 516.
  - umbilical, 801.
- Hemorrhoids, 292.
- Hepatitis, 743.
- Hernia, 344, 433.
  - uteri, 301, 423.
- Hicks, Braxton, cephalotribe, 681.
  - version, 619.
- Hip-bone, 133.
- Hook, blunt, 389.
- Horlick's malted milk, 253.

Hunger cure, 274.
Hydramnion, 346.
  acute, 348.
Hydramnios, 346.
Hydrocephalus, 399.
Hydrophobia, 340.
Hydrorrhœa gravidarum, 352.
Hymen, 19.
  cribriformis, 427.
  imperforate, 427.
  septus, 427.
Hyperemesis, 318.
Hypertrophy of vaginal portion in a virgin simulating laceration, 122.
Hypnotism, 208.
Hypoblast, 36.
Hypodermoclysis, 581, 734.
Hysterectomy, 734.
  abdominal, 674.
  vaginal, 675.
Hysterocele, 301.

Icterus neonatorum, 246.
Ilium, 133.
Impetigo herpetiformis, 337.
Incontinence of urine, 777.
Incubator, 254.
Induction of premature labor, 572.
Infarct, hemorrhagic, 354.
  red, 354.
  white, 354.
Infection, forms of, 691.
  gonorrhœic, 719.
    of child, 803.
  puerperal, 688.
Infectious diseases complicating pregnancy, 338.
Inflammation of genitals, 282.
Influenza, 339, 340.
Infusion, 582.
Injection, intra-uterine, 571.
  intravenous, 581.
  prophylactic, 203, 581.
  subcutaneous, 581.
  vaginal, 577.
Insanity, 333, 795.
Insomnia, 322.
Inversion of the uterus, 516.
Irrigation, intra-uterine, 571.
Ischiopagi, 412.
Ischiopubiotomy, 654.
Ischium, 133.
Ischuria, 776.

Jaundice, 717.

Key-hook, 685.
Kibbee, fever-cot, 740.
Kidney, floating, 758.
  of pregnancy, 334.
Knee presentation, 376.
Knee-bandage, 544.
Labor, abnormal, 357.
  antiseptic conduct of, 725.
  causes of, 129.
  conduct of normal, 180.
  duration of, 179.
  induction of premature, 572.
  influence of, on the child, 178.
    on the mother, 177.
  mechanism of, 173.
  missed, 275.
  normal, 129.
  precipitate, 359.
  premature, 271.
  stages of, 167.
  twin, 403.
Labor-bed, 219.
Labor-pains, 163.
Laborde, method of reviving, 562.
Laparo-elytrotomy, 657.
Laparo-hysterotomy, 658.
Laparotomy, 741.
Laundry, 222.
Leg-holder, 568.
Legs extended in front of fœtus in breech presentation, 379.
Leptothrix vaginalis, 286.
Leucocythæmia, 336.
Leucomaines, 692.
Leukæmia, 336.
Levret, method of delivering after-coming head, 384.
Ligaments of pelvis, 135.
Linea fusca, 95.
Lipothymia, 322.
Liquor amnii, 66.
    scanty, 349.
  folliculi, 5.
Lithopædion, 309.
Liver, 717.
  foaming, 707.
Lochia, 227.
Lying-in institutions, 216.
Lymphangeitis, 704, 710, 737.
Lymphothrombosis, 703, 710, 737.
Lysol, 580.

Magma réticulé, 43, 66.
Malaria, 339.
Malformations of genitals, 276.
Mammary gland, accessory, 773.
Marmorek's antistreptococcic serum, 732.
Mastitis, 337, 766.
    in child, 809.
Measles, 339, 779.
Meconium, 45.
Membrana granulosa, 5.
    intermedia, 43.
    propria, 10.
Membranes, abnormal, 412.
    extraction, 198.
    pupillary, 65.
    retention of parts, 750.
    vitelline, 13.
Meningitis, 744.
Menopause, 17.
Menses, 13.
Menstruation, 13.
    cessation of, 102.
Mesoblast, 36.
Mesoderm, 36.
Metritis, 284, 702, 708, 730.
Microbes, 690.
    non-pathogenic, 692.
    pathogenic, 692.
Midwives, 211.
Miliaria, 718.
Milk, 232.
    anomalous secretion, 758.
    sterilization, 249.
Miscarriage, 262.
Missed abortion, 276.
    labor, 275.
Mole, fleshy, 309, 352.
Monstrosities, double, 408.
Morisani, symphyseotomy, 648.
Morning sickness, 102.
Morula, 26.
Mother, care of, 233.
    changes in, during pregnancy, 84.
    condition, 226.
    sudden death, 548.
Moulding, 178.
Movement, fetal, 101.
Muguet, 806.
Müller, Arthur, dilator, 588.
Muscle, levator ani, 151.
    of pelvis, 147.
    of perineum, 147.
Muscle-cells, uterine, 85.
Myoma of uterus, 292.
Myxoma fibrosum placentæ, 352.

Naegele, forceps, 598.
    obliquity, 173.
    pelvis, 468.
    perforator, 678.
Navel, diseases of, 801.
Nephritis, 334, 717, 743.
Nervous system, diseases of, 789.
        disturbances, 717.
Nestle's food, 253.
Neuralgia, 322, 789.
Neuritis, 789.
New York Maternity Hospital, 222.
Nidation, 17.
Nipple-shield, 763.
Nipples, deep inflammation, 764.
    preparation for lactation, 128.
    sore, 761.
Nubility, 2.
Nuclein, 734.
Nursing, 235.
Nutrition, 43.
Nutrolactis, 760.

Obliquity of the head, lateral, 366.
    of Naegele, 173.
Occlusion-dressing of genitals, 200.
Oïdium albicans, 286.
Olivier, fillet-carrier, 388.
Omphalitis, 802.
Oöphoritis, 703, 709, 737.
Operations, obstetric, 565.
    preparation for, 590.
Ophthalmia neonatorum, 803.
Ophthalmoblennorrhœa, 803.
Orgasm, 20.
Os coxæ, 133.
    innominatum, 133.
    pubis, 133.
Osteomalacia, 483.
Ovary, 7.
Ovisacs, 7.
Ovulation, 2.
Ovum, 2.
    abnormalities, 412.
    diseases, 346.
    embedding, 27, 29.
    external migration, 12.
    internal migration, 12.
    primordial, 4.

Ovum at term, 66.
  transportation, 27.

Pack, cold, 741.
  warm, 331.
Palpation, 108, 187, 321.
Panhysterectomy, 674.
Paralysis, 324.
  due to pressure, 789.
  Erb's, 463.
  facial, of child, 616.
  of upper extremity, 462.
Parametritis, 709, 735.
Pasteurization, 250.
Patient, preparation of, 186.
Patients, separation of, 221.
Pelvic presentation, 376.
Pelvimetry, 115, 440.
Pelvis, 130.
  ankylosed transversely contracted, 475.
  asymmetric, 467.
  axes of, 141.
  bones, 130.
  brim, 138.
  cavity, 138, 141.
  classification of deformities of, 444.
  contracted, 436.
    by tumors, 493.
  coxalgic, 471.
  dangers for the fœtus in contracted, 459.
    for the mother in contracted, 458.
  deformities of, 436.
  diameters, 139.
  differences between male and female, 144.
    of, in different races, 146.
  flat, 448.
  flattened by dislocation of both femora, 456.
  frequency of narrow, 437.
  funnel-shaped, 481.
  generally contracted flat, 456.
    equally contracted, 444.
  inclination, 141.
  incurved, 482.
  infantile, 446.
  inferior strait, 138, 140.
  inlet, 138.
  justo minor, 444.
  kyphotic, 476.
Pelvis, male type, 445.
  muscles of, 147.
  nana, 445.
  narrow, 436.
  obliquely contracted, 468.
  obtecta, 481.
  of Landouzy, 476.
  of Naegele, 468.
  of new-born, 144.
  of reclination, 446.
  of Robert, 475.
  osteomalacic, 483.
  outlet, 130, 138, 140.
  pseudo-osteomalacic rhachitic, 489.
  rhachitic, 446.
    flat, 449.
    kyphotic, 480.
  scoliotic, 467.
    rhachitic, 467.
  simple flat, 448.
  split, 494.
  spondylolisthetic, 490.
  superior strait, 138, 140.
  too wide, 496.
  transversely contracted, 474.
  treatment of labor in flat and generally contracted flat, 463.
  without sacrum, 495.
    symphysis, 495.
Pemphigus, 337, 718.
  neonatorum, 811.
Percussion, 111.
Perforation of fetal head, 678.
Perforator, blunt expanding, Garrigues's, 736.
  Naegele's, 678.
  Thomas's, 679.
Pericarditis, 705, 713, 743.
Perimetritis, 284.
Perineorrhaphy, 726.
Perineum, fasciæ of, 151.
  laceration of, 536.
  muscles of, 147.
  support of, 192, 540.
Period, menstrual, 13.
Peritonitis, 705, 711, 738.
Pessary, 299.
Petechiæ, 718.
Peterson, colpeurynter, 575.
Phlebitis, 705, 714, 745, 802.
  uterine, 745.
Phlegmasia alba dolens, 706, 713, 745, 784.

- Phlegmasia cærulea dolens, 714.
- Phlegmon, 718.
- Physometra, 458.
- Pinard, symphyseotomy, 649.
- Placenta, 68.
  - abscess of, 354.
  - adherent, 417.
  - anomalies of, 354.
  - battledoor, 70.
  - calcareous incrustations, 354.
  - double, 69.
  - expulsion, 176.
  - expression, 196.
  - fetal, 68.
  - marginata, 355.
  - maternal, 68.
  - membranacea, 354.
  - myxoma fibrosum, 352.
  - prævia, 418, 496.
    - cervical, 499.
  - premature detachment of normally inserted, 505.
  - retained, 417.
  - retention of parts, 751.
  - rupture of the circular sinus of, 507.
  - succenturiata, 354.
  - tumors of, 355.
- Placenta-forceps, 570.
- Plate, parietal, 37.
  - somatic, 37.
  - splanchnic, 37.
  - visceral, 37.
- Pleurisy, 340, 705, 713, 741.
- Pneumonia, 340, 713, 742.
- Polygalactia, 758.
- Polyneuritis, 789.
- Polypus, decidual, 751.
  - fibrinous, 751.
- Pony-room, 219.
- Porro's operation, 670.
    - indications for, 671.
- Position for operations, 591.
  - genupectoral, 299.
  - occipito-anterior, 362.
  - occipitolateral, 365.
  - occipitoposterior, 362.
  - of fœtus, 81.
  - of the patient in the three stages, 191.
  - persistent mentoposterior, in face presentation, 371.
  - Sims's, 118.
- Post-partum hemorrhage, secondary, 755.
- Posture, hanging, 591.
- Prague, method of delivering after-coming head, 385.
- Pregnancy, abnormal, 257.
  - combined intra-uterine and extra-uterine, 311.
  - complicated with chronic diseases, 340.
  - diagnosis between first and later, 121.
  - differential diagnosis of, 105.
  - dress and regimen during, 126.
  - duration, 51.
  - extra-uterine, 302.
  - interruption, 262.
  - malignant tumor of, 752.
  - normal, 27.
  - operations during, 296.
  - signs of, 100.
  - spurious, 107.
- Premature labor, induction of, 272.
- Presentation, anterior ear, 366.
    - parietal, 366.
  - breech, 376.
  - brow, 374.
  - compound, 395.
  - face, 367.
  - foot, 376.
  - footling, 376.
  - knee, 376.
  - of fœtus, 75.
  - pelvic, 376.
  - posterior ear, 366.
    - parietal, 366.
  - transverse, 391.
- Pressure marks, 461.
  - necrosis of vagina, 532.
    - of uterus, 532.
- Procidentia, 300.
- Prolapse, 300.
- Promontory, 131.
  - double, 442.
  - false, 443.
- Pronucleus, female, 24.
  - male, 24.
- Pruritus vulvæ, 288.
- Pseudocyesis, 107.
- Ptomaines, 692.
- Ptyalism, 321.
- Puberty, 1.
- Pubes, 133.

Pubiotomy, 651.
Puerperal infection, curative treatment, 728.
    diagnosis, 707.
    etiology, 695.
    localized, 707.
    lymphatic, 707.
    mortality, 719.
    of child, 802.
    pathology, 702.
    phlebitic, 707.
    prevention of, in hospitals, 723.
        in private practice, 726.
    prognosis, 707.
    sources, 696.
    symptoms, 707.
    treatment, 720.
    ways by which the infecting agent enters, 699.
  state, signs of, 243.
Puerpery, 225.
Putrescentia ovarii, 703.
  uteri, 732.
Puzos, method of delivering after-coming head, 384.
Pyæmia, 706.

Quadruplets, 258.
Quickening, 105.

Reed and Carnrick's lacto-preparata, 253.
    soluble food, 253.
Récamier, dull curette, 569.
Rectum, 435.
  carcinoma of, 435.
Respiration, 46.
  cause of, 179.
Rest after delivery, 241.
Retractor, vaginal, 568.
Retroflexion, 297.
  partial, of the gravid uterus, 298.
Retroversion, 300.
Rhomb of Michaelis, 116.
Rickets, 451.
Rosary, rhachitic, 451.
Robb, leg-holder, 568.
Rotation in use of wards, 222.
Routh, fillet-carrier, 635.
Rupture of blood-vessels, 546.
  of heart, 546.
  of organs, 525.
Rupture of psoas muscle, 546.
  of spleen, 546.
  of umbilical vessels in velamentous insertion, 509.
  of uterus, 525.

Sacrum, 131.
  oscillatory movements of, 136.
Salpingitis, 703, 709, 737.
Salt, normal solution, 581.
Sapræmia, 728.
Sarcoma, decidual, 752.
  of uterus, 293.
Scarlet fever, 339, 798.
Schlussplatte, 35.
Schroeder, vaginal retractor 568.
Schultze's swingings, 560.
Secretion, 45.
Secundines, 198.
Segment, lower uterine, 153.
Segmentation, 24.
  nucleus of, 24.
Seibert, milk sterilizer, 249.
Septicæmia, 340, 692.
  acutest, 706, 718, 746.
  in children, 694.
Serre-fine, 542.
Serum, antistreptococcic, Marmorek's, 734.
Sex, cause of, 73.
Shoulders, passage of, 193.
Sickness, monthly, 13.
Sick-ward, 222.
Siegemundin, double manœuvre, 635.
Sign, Braun-Fernwald's, 103.
  Hegar's, 103.
Signs of puerperal state, 243.
Silvester, method of reviving, 561.
Simon, sharp curette, 569.
Simpson, A. R., axis-traction forceps, 595, 602.
    basilyst, 683.
  J. Y., chloroform, 203.
    forceps, 598.
Sims, sharp curette, 569.
Sinus, lactiferous, 94.
  urogenital, 277.
Skin diseases, 718.
Smallpox, 339, 799.
Smellie, method of delivering after-coming head, 384.
Somatopleure, 37.
Souffle, uterine, 104.

Soxhlet, milk sterilizer, 250.
Space, intervillous, 33.
Speculum, Brewer's, 117.
  Garrigues's weight, 568.
  Sims's, 118.
Spermatozoid, 21.
Splanchnopleure, 37.
Spleen, 717.
Spondylolisthesis, 489.
Spongiopiline, 742.
Spot, germinal, 13.
Sprue, 806.
Stalk, abdominal, 42.
Stethoscope, 187.
Stomatitis, gonorrhœal, 806.
Streak, primitive, 37.
Striæ, 94, 95.
  albicantes, 95.
Superfecundation, 257.
Superfetation, 257.
Supporter, abdominal, 240.
Sutures, 156.
Symphyseotomy, 637, 655.
  Ayer's, 649.
  Harris's, 649.
  indications for, 640.
  Morisani's, 648.
  Pinard's, 649.
  who shall perform? 656.
Symphyseotomy-bandage, 653.
Symphysis pubis, 135.
Syncytioma, 752.
Syncytium, 31.
Syphilis, 340.
Syringes, 726.
  bulb and valve, 183.
  fountain, 182.
  urethral, 286.
Systemic disturbances due to pregnancy, 318.

Table, 590.
  Daggett's, 108.
Tamponade, 565.
Tarnier, axis-traction forceps, 600.
  basiotribe, 683.
Teeth, caries of, 321.
Tetanoid contractions, 791, 795.
Tetanus, 324, 791.
  neonatorum, 817.
Tetany, 323.
Theca externa, 10.
  interna, 10.
Thomas, craniotomy-forceps, 682.
  dull wire curette, 569.
  perforator, 679.
Thoracopagi, 410.
Thorn-pelvis, 462.
Thrombosis of artery, 781.
  of pulmonary artery, 784.
  of uterine sinuses, 36.
  of venous system, 782.
Thrombus of vulva, 292.
Thrush, 806.
Thymus, hypertrophy, 810.
Toothache, 321.
Transfusion, 582.
Transmission between mother and fetus, 44.
Travail insensible, 167.
Triplets, 258.
Tuberculosis, 342.
Tumors, malignant, of pregnancy, 752.
  of a vulva, 453.
  of genitals, 289.
  ovarian, 432.
  springing from the pelvic bones, 493.
  vaginal, 433.
Tunica intermedia, 66.
  media, 43.
Turning, 618.
Turns, 13.
Tympania uteri, 458, 707.
Typhoid fever, 339, 800.
Twin labor, 403.
Twins, 258.
  locked, 407.
  Siamese, 409.

Ulcer, umbilical, 801.
Umbilicus, arteritis, 802.
  fungus, 801.
  gangrene, 802.
  hemorrhage, 801.
  phlebitis, 802.
  ulcer, 801.
Unguentum Credé, 732.
Ureter, course of, during pregnancy, 90.
Urine, examination of, 128.
  incontinence, 777.
  retention, 334, 776.
Uropoietic organs, diseases, 776.
Utero-ovarian amputation, 670.
Uterus, anteflexion, 755.

Uterus at the end of each calendar month of pregnancy, 85.
        of pregnancy, 86, 98.
    bicornis, 281.
    bilocularis, 282.
    blood-vessels at the end of pregnancy, 92.
    carcinoma, 432.
    compression, 194.
    contraction, 102.
    didelphys, 278.
    diseases, 747.
    duplex separatus, 278.
    elevation, 758.
    entrance of air into vein, 786.
    faulty contractions, 357.
    hernia, 301.
    horns, 276.
    hour-glass contraction, 418.
    inertia, 357.
    innervation, 163.
    inversion, 516.
    involution, 228.
    lateroversion, 421 757.
    lower segment, 153.
    lymphatics, 704.
    muscular layer, 88.
    myoma, 429.
    nerves of pregnant, 93.
    partial prolapse, 423.
    pressure necrosis, 532.
    prolapse, 757.
    putrescence, 732.
    retroflexion, 756.
    retroversion, 756.
    rupture, 525.
    sacculation, 421.
    septus, 282.
    subinvolution, 747.
    superinvolution, 750.
    tetanus, 360.
    tympania, 707.
    unicornis, 279.
    vaginal fixation, 420.
    ventral fixation, 420.
    virgin, 84.

Vagina, 155.
    atresia, 427.
    bacteriology, 125.
    change of color, 103.
    double, 428.
    gangrene, 730.
Vagina, hæmatoma, 521.
    laceration, 535.
    narrowness, 428.
    obstruction, 427.
    pressure necrosis, 532.
    prolapse, 757.
    stenosis, 427.
    thrombus, 521.
Vaginism, 428.
Vaginitis, 284, 702.
Vaporization, 267.
Vectis, 617.
Vegetations, 289.
Veins, varicose, 291.
Ventilation, 220.
Version, 618.
    Busch's, 625.
    cephalic, 624.
    choice of hand, 629.
    compared with forceps delivery, 636.
    dangers for fœtus, 636.
        for mother, 636.
    D'Outrepont's, 625.
    external, 618.
    indication for, in contracted pelvis, 466.
    internal digital, 619.
        manual, 623.
    pelvic, 626.
    podalic, 627.
    spontaneous, 393.
Vesicles, 718.
    blastodermic, 26, 36.
    germinal, 13.
    umbilical, 41, 72.
Viability, 63.
Villi, fixation, 31.
    nutrition, 31.
Vitellus, 13.
Vomiting, uncontrollable, 318.
Vulva, 155.
    gangrene, 429, 730.
    hæmatoma, 521.
    laceration, 536.
    narrowness, 428.
    œdema, 429.
    thrombus, 521.
Vulvitis, 702.

Walcher, hanging posture, 591.
Warts, venereal, 289.
Water-closets, 221.

THE END.

LANE MEDICAL LIBRARY

To avoid fine, this book should be returned on
or before the date last stamped below.

0124 Garrigues, H.J.
G24 The science of obstetrics 59145
1902

NAME	DATE DUE